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HS-800 868, 870, 872, 879, 881, 885-886;
889-892 HS-845 008 - HS-845 009

U.S. Department of
Transportation

National Highway
Traffic Safety
Administration



*Shelve in stacks
S.B.T.*

Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

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HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

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SAMPLE ENTRIES

JOURNAL ENTRY

Title of Document

SYNTHESIS OF CASE LAW JURISPRUDENCE RELATING TO WET-WEATHER HIGHWAY CONDITIONS

Journal Citation

Highway Research Record n 376 p29-36 (1971)
D. C. Oliver 1971

Author(s)

Sponsored by Highway Res. Board Steering Com. for Workshop on Anti-Skid Program Management and presented at the workshop.

Search Terms

Descriptors: *Liability, *Negligence, *Accident responsibility, *Legal responsibility, *Wet road conditions, *Court decisions, *State government, *Skidding accidents, *Warning signs, *Highway maintenance, *Litigation, *Icy road conditions.

Abstract

The extant case law on legal liability for accidents occurring on icy and wet highways has established three central areas and one subarea in the jurisprudence of maintenance liability. These areas are compliance with general duties in order to escape liability; damages resulting from noncompliance (negligence); contributory negligence as a bar to recovery; and advisory signing as a technique in meeting general duties. Court decisions covering these four areas are presented.

NHTSA
Accession
Number

HS-012 289

*Subject heading in Subject Index

CONTRACT REPORT

EQUIPMENT AND PROCEDURES FOR MEASURING GLARE FOR MOTOR VEHICLES. FINAL REPORT

Corporate author

Teledyne Brown Engineering
N. E. Chatterton J. D. Hayes E. W. George 1972 102p
Contract DOT-HS-089-I-139

Availability

NTIS

Descriptors: *Glare, *Glare reduction, *Visual perception, *Photometers, *Luminance, *Hydraulic equipment, *Central vision, *Field of view, *Backgrounds, *Contrast, *Light conditions, *Brightness, *Test facilities, *Test equipment, *Vehicle safety standards, *Simulators, *Light, Reflectance, *Measuring instruments.

A procedure and description of equipment for measuring glare from a driver's own vehicle are presented. The procedures are based on a disability glare theory as applied to foveal vision. Two pieces of apparatus were constructed to provide the measurement capability. One of them simulates diffuse sky glare and the other simulates direct solar glare. Methods of combining data from these measurements are presented along with scaling laws selected to provide a value for glare as it would be under natural daylight conditions. A standard for allowable glare levels from the vehicle is developed which is independent of the measurement procedure. Test results from a passenger car are presented and compared with this standard. Recommendations for improvements to the apparatus and additional research requirements for improvement to the theory are made.

HS-800 731

*Subject heading in Subject Index

1. ACCIDENTS

1A. Emergency Services

HELICOPTER SERVICES STUDY. FINAL REPORT 111972 12447P 20REFS

Sponsored by National Hwy. Traf. Safety Administration.
NTIS

Helicopters, Aerial surveillance, Police vehicles, Emergency vehicles, California, Peak hour traffic control, Traffic law enforcement, Transportation of injured, Stolen vehicles, Automobile identification, Police traffic services, Traffic surveillance, Urban areas, Rural areas, Month, Traffic control costs, Patrolling, Vehicle operating costs, Benefit cost analysis, Police training, Radios, Vehicle maintenance, Abandoned vehicles, Radio communication, Disabled vehicles, Crowd management, Manuals, Pilots, Aircrew selection, Vehicle inspection, Vehicle usage, Insurance, Traffic delay minimization, Time of day, Program evaluation

Two helicopters were utilized in the San Francisco Bay and Indio Desert areas to determine the use of the helicopter as a patrol vehicle, as a vehicle for special missions, as an emergency transportation vehicle, and as a commuter traffic surveillance platform. The patrol phase, which involved enforcement surveillance and response to motorist demands, was effective only in the Indio Area. The scheduled special missions phase involved auto theft investigation, disaster surveillance, monitoring of demonstrations, and aerial photography. The helicopter's effectiveness in this area has not yet been evaluated. Helicopters were most effective in providing emergency transportation. The Bay Area helicopter was used for peak hour traffic surveillance for a three month period during which time 869 incidents, primarily involving aid to stalled vehicles, were acted upon. A benefit cost analysis of helicopter services was performed. Pilot and observer selection and training and helicopter services manuals are included.

HS-845 008

1B. Injuries

DETERMINATION OF INJURY MECHANISMS FROM FIELD ACCIDENT INVESTIGATIONS

Michigan Univ., Ann Arbor
D. F. Huelke 1973 17p 20refs
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Injury causes, Fatality causes, Ejection, Ejection caused injuries, Steering wheel caused injuries, Steering columns, Windshield caused injuries, Instrument panel caused injuries, Injuries by accident type, Injury prevention, Accident investigation, Automobile safety characteristics, Injury severity, Secondary collisions, Rollover accidents, Side impact collisions, Rear end collisions, Automobile interior design

Major causes of death and injury in automobile accidents are occupant ejection and steering assembly, windshield, or instrument panel impacts. Types of injuries produced by these secondary collisions are described. Automobile design improvements to reduce injury potential are mentioned. Injury patterns and injury severity associated with side impact, rear end, and rollover accidents are also briefly discussed.

HS-013 408

OCCUPANT PROTECTION RESEARCH NEEDS

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 5N.
HS-013 419

BIOMECHANICS AND CRASH SURVIVABILITY

Federal Aviation Administration, Washington, D.C.
R. F. Chandler 1973 33p 88refs
Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

Biomechanics, Accident survivability, Simulation models, Injury research, Human body impact tolerances, Dynamic models, Human body simulation, Injury prediction, Crash response forecasting, Mathematical models, Human acceleration tolerances, Occupant modeling, Biokinematic models, Injury tolerances, Anthropometric dummies, Head impact tolerances, Validation, Animal experiments, Cadavers in testing, Human body kinetics, Human body kinematics, Computerized simulation, Reviews

The development of dynamic injury modeling techniques is traced. Head injury models, kinetic or kinematic models, and anthropometric dummies are discussed. The ability to specify tolerance to injury by a consistent analytical method has been enhanced through the use of dynamic injury models. Complex models that can be used to investigate and describe the mechanism of injury as well as the occurrence of injury are becoming available. Kinetic models are available to predict the motion of the occupant during a crash and, when combined with an injury prediction model, can provide an accurate prediction of crash response. Problems continue to exist in validation of these models and in recognizing their limitations. Research is underway to provide data on the parameters required for these models, but as yet these data are far from complete. The mechanical model, or dummy, suffers from many of the same limitations as the mathematical model. In addition, problems of reliability and reproducibility due to mechanical variations must be solved.

HS-013 427

1C. Investigation And Records

DRIVER-VEHICLE CONTROL PERFORMANCE

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 3D.
HS-013 410

NATIONAL ACCIDENT DATA SYSTEM

General Motors Corp., Detroit, Mich.
C. T. Terry, R. W. Schneider 1973 9p 1ref
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Accident statistics, Information system design, Data banks, Data acquisition, Accident reports, Accident investigation, Computerized records management, Injury prevention, Program evaluation, Research methods, Data uniformity, Government industry cooperation, Accident research

Accident data are needed by automobile manufacturers to evaluate present safety systems; predict performance of proposed safety systems; identify problem areas and evaluate solutions on cost/benefit basis; and to estimate human impact tolerances.

Group 1C—Investigation And Records

Qualities of a good accident data system include rapid feedback, random data sample, current model data, and data compatibility. The National Accident Data System proposed by General Motors Corp. is outlined. This system involves designating certain geographic regions of the country as sample areas where extensive surveying and profiling could be conducted. Four levels of information within the specific regions would be gathered—exposure data (non-accident), level 1 accident data, level 2 accident data, and special accident studies. The acquired accident data would be entered in a centralized data bank. Since this program would benefit the industry as well as the Government, the implementation and annual operation of this program by joint Government/industry support is recommended.

HS-013 416

RESEARCH--PROGRESS IN HIGHWAYS

Highway Res. Board, Washington, D.C.
For primary bibliographic entry see Fld. 2.
HS-013 420

SIMULATION--ADVANTAGES AND DISADVANTAGES [AND] AUTOMOTIVE RECORDER RESEARCH PROGRAM

Department of Transp., Washington, D.C.
For primary bibliographic entry see Fld. 4G.
HS-013 421

A STUDY OF 1960-67 AND 1968-70 MODEL VOLKSWAGENS AND OTHER SEDANS IN RURAL U. S. ACCIDENTS

Calspan Corp., Buffalo, N.Y.
J. W. Garrett 1973 97p 9refs Rept. No. VJ-2760-V-2
Sponsored by Volkswagen of America, Inc.
Corporate author

Rural accidents, Volkswagens, Vehicle age, Accident analysis, Injury causes, Rollover accidents, Door opening accidents, Ejection, Energy absorbing steering columns, Chi square test, Driver age, Driver sex, Vehicle size, Time of day, Day of week, Month, Impact angle, Impact velocity, Accident severity, Crashworthiness, Passenger compartments, Accident caused fires, Damage severity, Steering control rearward displacement, Injuries by body area, Accident report forms, Medical case reports, Injury severity index, Accident severity index, Automobile models, Standardization, Fire walls, Roof failures, Accident types, Injury severity

Rollover accident frequency has decreased from about 25% in 1960-67 Volkswagens to about 16% in 1968-70 models. Door opening has decreased from 37.2% for 1960-67 Volkswagens to 13.3% for 1968-70 models. Ejection through open doors represented about 75% of all ejections in 1960-67 cars and about 50% in 1968-70 cars. Windshield and window ejections increased. For Volkswagen, the windshield now is the second most frequent ejection site. Seat track damage in front impacts has decreased from 32.1 to 9.3% in the 1968-70 Volkswagens. Energy absorbing steering columns have virtually eliminated column penetration into the passenger compartment for all 1968-70 cars. Among 1967-70 Volkswagen occupant top structure, door ejection, and windshield caused injuries decreased. Flexion-torsion and instrument panel caused injuries increased. Study results indicate that 1968-70 Volkswagens resemble 1968-70 light U. S. cars and foreign sedans with respect to accident

factors, types of vehicle damage, and occupant injury causes more closely than did 1960-67 Volkswagens.

HS-013 425

MOTOR CARRIER ACCIDENT INVESTIGATION. MURPHY TRANSPORTATION INC.**ACCIDENT--NOVEMBER 6, 1972--WILDWOOD, FLORIDA**

111972 1212P Rept. No. 72-9
Corporate author

Accident case reports, Accident investigation, Driver fatigue caused accidents, U turns, Vehicle vehicle collisions, Florida, Tractor semitrailers, Property damage accidents, Truck accidents, Wet road conditions, Reduced visibility, Negligence, Accident factors, Driver characteristics

At 10:20 p.m. a tractor semitrailer, obstructing the roadway in an illegal U turn maneuver, was struck broadside by two automobiles, one of which underrode the trailer. The driver and two passengers of this car died of impact injuries to the head and upper body. The driver's 9-year old daughter, who had been lying across the front seat, received minor injuries. The other car collided with the right tandem wheels of the trailer and bounced back, coming to rest in the outside northbound lane. All four occupants of this car received serious injuries. The truck driver had exceeded hours of service limitations, and lack of sleep may have affected his judgment. Wet road conditions and reduced visibility contributed to the accident.

HS-013 460

1D. Locations**GUIDELINES: SPOT IMPROVEMENTS**

Jorgensen (Roy) Associates, Inc., Gaithersburg, Md.
R. E. Jorgensen 1973 19p 1ref
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Highway accident potential, Accident location, Highway improvements, Hazards, Alabama, Nebraska, Highway maintenance, Highway management, Systems analysis, State highway departments, Safety program effectiveness, Program evaluation, Benefit cost analysis, Accident prevention

Historically, the process for identifying hazardous highway locations has been largely dependent on the incidence of accidents. The accidents have had to occur and be related to the hazard before improvements have been made. However, Alabama and Nebraska are now undertaking state-wide identification of hazard indicators on their highway networks. The approaches employed in each state by which potentially hazardous locations are being identified, and corrective measures scheduled on the basis of hazard indicators are described. Experience in Alabama and Nebraska indicates that at least three broad actions are needed to bring about advances in spot improvement programs. Highway agencies must recognize and accept responsibility for hazardous locations—the potential as well as the accident proven locations; a systems management approach should be adopted; and effective training personnel who are expected to identify hazards, analyze reports, initiate spot improvements, and measure results must be provided.

HS-013 413

2. HIGHWAY SAFETY

HIGHWAY SAFETY PROGRESS AS REFLECTED IN ACCIDENT DATA

General Motors Corp., Detroit, Mich.

L. C. Lundstrom, A. J. Yanik 1973 12p 10refs

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Vehicle safety, Accident statistics, Fatality prevention, Program evaluation, Safety device effectiveness, Automobile safety characteristics, Injury prevention, Fatality rates, Data acquisition, Benefit cost analysis

An assessment of highway safety progress since 1966 is made. In 1972 more motor vehicle fatalities were recorded than ever before. However, fatalities per 100 million vehicle miles have been reduced from 5.76 in 1966 to a current level of 4.5; the fatality rate per 100,000 population has decreased from 27.1 to 27.0; and the death rate for every 10,000 motor vehicles has gone down from 5.53 to 4.69. Due to inadequate accident data it has been difficult to determine the effectiveness of an individual safety system in reducing accident fatalities. A few attempts made at applying the individual benefits of a safety system to the national level are mentioned. It is recommended that a National Accident Data System be established which would remove controversy from accident data gathering techniques by establishing a uniform data gathering format and storage system that would produce reliable accident data. Full usage of seat belts, elimination of the chronic drunk driver, and defusion of roadside hazards are recommended as measures to reduce traffic fatalities.

HS-013 414

PEDESTRIAN SAFETY FOR URBAN STREETS, VOL.

1. FINAL REPORT

San Jose Dept. of Public Works, Calif.

For primary bibliographic entry see Fld. 3K.

HS-845 009

2. HIGHWAY SAFETY

RESEARCH--PROGRESS IN HIGHWAYS

Highway Res. Board, Washington, D.C.

J. K. Williams 1973 8p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Highway research, Safety research, Traffic research, Accident prevention, Motion pictures, Contracts, Research facilities, Ramp control, Communication systems, Impact attenuators, Highway signs, Warning signs

Applications of highway safety research in the areas of ramp control, communication systems, tire attenuators, atomic traffic signs, and blowing dust warning signs, and some current highway safety research projects are briefly discussed. It is suggested that accidents can be most effectively prevented by providing highways and vehicles which reduce the possibility of human error to a minimum.

HS-013 420

2D. Design And Construction

EVALUATION OF MINOR IMPROVEMENTS--PT. 8, GROOVED PAVEMENTS. FINAL REPORT

California Div. of Highways, Sacramento

J. I. Karr 1972 84p 13refs Rept. No. CA-HY-TR-2151-4-71-00

Prepared in cooperation with the Federal Hwy. Administration.

Corporate author

Grooving, Highway improvements, Safety program effectiveness, Accident prevention, Pavement skid resistance, Pavement wear, Pavement surface texture, Wet road conditions, Accident rates, Wet vs dry road accidents, Stopping distance, Motorcycle road interface, Traffic volume, Mathematical analysis, Accident statistics, Chi square test, Accident severity, Accident types, Alignment, Portland cements, Asphalt pavements, Concrete pavements, Regression analysis, Accident risk forecasting, California

The effectiveness of pavement grooving in eliminating accidents was evaluated and a predictor of accident reduction after grooving was established. A before-and-after study method was used to evaluate 39 grooved cement concrete projects on California State highways. A wet pavement condition was defined to exist during any hour 0.01 inch or more precipitation occurred. An isohyetal map of California that reflects the percent of wet time was used as the basis for estimating wet accident rates. The 3/4 in. spaced grooves gave the best after-grooving accident reduction. Wet accidents decreased 75% and total accidents decreased 37% despite a 17% increase in traffic and wetter after grooving periods on those 14 projects grooved on 3/4-in. centers. It is recommended that treatment of the pavement by grooving should be performed on no less than 500 feet and for most pavements, a satisfactory groove pattern would be 1/10 in. wide, 1/8 in. deep, and spaced on 3/4 in. centers.

HS-013 406

GUIDELINES: SPOT IMPROVEMENTS

Jorgensen (Roy) Associates, Inc., Gaithersburg, Md.

For primary bibliographic entry see Fld. 1D.

HS-013 413

HIGHWAY SAFETY PROGRESS DURING RECENT YEARS

North Carolina Univ., Chapel Hill. Hwy. Safety Res. Center

B. J. Campbell 1973 10p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Fatality rates, Accident factors, Interstate highway system, Highway standards, Design standards, Human factors, Federal role, Highway safety programs, Federal aid, Highway design

In 1961 the accident fatality rate was a little less than 5.2 deaths per hundred million vehicle miles. There was a 10% increase to 5.7 by 1966 and then the rate fell from 5.7 to about 4.7 in 1971. Progress in the highway and driver aspects of highway safety is discussed. The most significant factor in roadway safety progress is the steady increase in availability of the Interstate and other full access control facilities. The Interstate System enjoys a much lower death rate than the rest of the highway system. Another indicator of progress with respect to highways

Field 2—HIGHWAY SAFETY**Group 2D—Design And Construction**

is symbolized by publication of Highway Design and Operational Practices Related to Highway Safety, which standardized long advocated highway design concepts--the principles of crashworthy highways. Less progress is evident with respect to driver programs. Many have failed to produce measurable benefits. The need to reassess and improve present driver programs is emphasized. The federal role in promoting highway safety is also briefly discussed.
HS-013 415

2E. Lighting**VISION AND HIGHWAY SAFETY: AN OVERVIEW SINCE 1962**

For primary bibliographic entry see Fld. 3L.
HS-013 422

HIGHWAY EMERGENCY LIGHT CHEMILUMINESCENT FLARES. FINAL REPORT

Naval Weapons Center, China Lake, Calif.
S. M. Little, C. H. Morley, D. W. Harris 1973 106p 11refs Rept. No. TN-353-14; TN-353-15; TN-353-16; TN-353-17
Contract DOT-HS-194-2-3071A
Report for Mar 1972-Jun 1973.
NTIS

Flares, Chemiluminescence, Economic analysis, Compatibility, Hydrogen peroxide, Catalysts, Chemical reactions, Storage, Stability, Manufacturing, Packaging, Chemical properties, Cleaning, Chemicals, Materials, Costs, Specifications, Economic factors, Reliability, Drop tests, Performance tests, Performance characteristics, Evaluation

Four technical notes describing the development, production, and evaluation for highway traffic use of a non-thermal, fluorescent light source are presented. Operating instructions, preliminary fabrication data, and a cost analysis which shows that fabrication costs can be less than 0.5 dollars in production quantities are included. The behavior of Chemlite when subjected to environmental conditions is also described and minor tests performed at the Naval Weapons Center for demonstrating the use of Chemlites as emergency highway lights are reported. The chemical lights met the required engineering tests and the reliability of functioning has been established as greater than 0.995 at the 90% confidence level.
HS-800 892

2F. Maintenance**GUIDELINES: SPOT IMPROVEMENTS**

Jorgensen (Roy) Associates, Inc., Gaithersburg, Md.
For primary bibliographic entry see Fld. 1D.
HS-013 413

2H. Police Traffic Services**HELICOPTER SERVICES STUDY. FINAL REPORT**

111972 12447P 20REFS
Sponsored by National Hwy. Traf. Safety Administration.
NTIS

Helicopters, Aerial surveillance, Police vehicles, Emergency vehicles, California, Peak hour traffic control, Traffic law enforcement, Transportation of injured, Stolen vehicles, Automob-

ile identification, Police traffic services, Traffic surveillance, Urban areas, Rural areas, Month, Traffic control costs, Patrolling, Vehicle operating costs, Benefit cost analysis, Police training, Radios, Vehicle maintenance, Abandoned vehicles, Radio communication, Disabled vehicles, Crowd management, Manuals, Pilots, Aircrew selection, Vehicle inspection, Vehicle usage, Insurance, Traffic delay minimization, Time of day, Program evaluation

Two helicopters were utilized in the San Francisco Bay and Indio Desert areas to determine the use of the helicopter as a patrol vehicle, as a vehicle for special missions, as an emergency transportation vehicle, and as a commuter traffic surveillance platform. The patrol phase, which involved enforcement surveillance and response to motorist demands, was effective only in the Indio Area. The scheduled special missions phase involved auto theft investigation, disaster surveillance, monitoring of demonstrations, and aerial photography. The helicopter's effectiveness in this area has not yet been evaluated. Helicopters were most effective in providing emergency transportation. The Bay Area helicopter was used for peak hour traffic surveillance for a three month period during which time 869 incidents, primarily involving aid to stalled vehicles, were acted upon. A benefit cost analysis of helicopter services was performed. Pilot and observer selection and training and helicopter services manuals are included.
HS-845 008

2I. Traffic Control**VISION AND HIGHWAY SAFETY: AN OVERVIEW SINCE 1962**

For primary bibliographic entry see Fld. 3L.
HS-013 422

3. HUMAN FACTORS**3A. Alcohol**

SYMPOSIUM ON PSYCHOLOGICAL ASPECTS OF DRIVER BEHAVIOUR, VOL. 1, NOORDWYKERHOUT, THE NETHERLANDS, AUGUST 2-6, 1971
111971 12560P REFS

Sponsored by the North Atlantic Treaty Organization. Includes HS-013 462--HS-013 489.
Corporate author

Driver behavior research, Psychological factors, Driver vehicle interface, Driver performance, Driver behavior, Driving simulators, Simulation models, Driving task analysis, Driver simulation research, Driving simulation research, Research methods, Conferences, Driver evaluation devices, Human factors, Alcohol effects, Man machine systems, Perception, Decision making, Driver vehicle road interfaces, Driver modeling

The object of the symposium was to improve the communication between the field of driving task research, human performance theory, and research applied to the design of vehicle and road and to driver education. The symposium was organized into two divisions. The first division, covered in volume 1, provides a review of research on driver behavior and human performance theory with an eye for application of results. Personality assessment methods, aimed at predicting

good and bad driver performance, and simulation techniques are emphasized.
HS-013 461

SOME REMARKS ON THE EFFECT OF DRUGS, LACK OF SLEEP AND LOUD NOISE ON HUMAN PERFORMANCE

Rijkseverdedigingsorganisatie TNO, Soesterberg (Netherlands)
For primary bibliographic entry see Fld. 3D.
HS-013 463

3B. Anthropomorphic Data

DUMMIES--THEIR FEATURES AND USE

General Motors Corp., Detroit, Mich.
R. L. LeFevre, J. N. Silver 1973 19p 4refs
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Anthropomorphic dummies, Human body simulation, Anthropomorphic dummy design, Performance tests, Design standards, Specifications, Data acquisition, Positioning, Anthropometry, Statistical analysis, Restraint system tests, Test reproducibility, Impact sleds

In recent years anthropometric dummies have moved from the relative obscurity of a supportive role to the very forefront of automotive safety testing technology. A brief history of the use of dummies in the automotive industry is traced and the development of General Motors Hybrid 1 and Hybrid 2 anthropomorphic dummies is discussed. The Hybrid 1 dummy was put into service in General Motors in April, 1971, and was used as the standard test dummy until the adoption of Hybrid 2 in 1972. The features, use, and variability of the Hybrid 2 dummy are described. It is concluded that the Hybrid 2 dummy is an acceptable device for testing air bag restraint systems and for testing the integrity of seat belt systems. However, it is not suitable for determining injury levels with belt systems because of limitations in the dummy and testing technology.
HS-013 411

OCCUPANT PROTECTION RESEARCH NEEDS

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 5N.
HS-013 419

BIOMECHANICS AND CRASH SURVIVABILITY

Federal Aviation Administration, Washington, D.C.
For primary bibliographic entry see Fld. 1B.
HS-013 427

AN EVALUATION OF THE DYNAMIC PERFORMANCE CHARACTERISTICS OF ANTHROPOMORPHIC TEST DEVICES. VOL. 2. SUPPLEMENTAL DATA REPORT. FINAL REPORT

Calspan Corp., Buffalo, N.Y.
N. J. DeLeys 1973 210p 1ref Rept. No. FA-5018-V-2
Contract DOT-HS-053-1-129
Report for Jun 1971-Jan 1973.
NTIS

Anthropomorphic dummies, Head forms, Restraint system tests, Restraint system effectiveness, Impact tests, Occupant

kinematics, Drop tests, Pendulum tests, Impact sleds, Webbing, Seat belt slack, Restraint system assembly anchorages, Seat design, Severity indexes, Acceleration response, Impact velocity, Laminated glass, Tempered glass, Three point restraint systems, Four point restraint systems, Restraint system failures, Seat belt buckles, Inertia reels, Seat belts, Performance tests

Data from component and accelerator sled tests of a 50th percentile hybrid dummy that were performed to supplement results of previous dummy performance tests are presented. Drop tests of instrumented Alderson dummy fiberglass and standard aluminum heads, arrested pendulum tests to measure non-impact dynamic response characteristics of the Alderson fiberglass head attached to a Sierra single durometer rubber neck, and tests in which the pendulum apparatus was used to impact both types of heads against simulated windshields of tempered and laminated glass were conducted. Two series of sled tests were performed in which the responses of the dummy restrained by a three point restraint system in 30 mph impact tests were measured. The test configurations included variations of the type of seat, webbing properties, belt slack, anchor number (three or four point), and seat belt assembly anchorages. Head Injury Criteria calculated from results of selected accelerator sled tests are included.
HS-800 870

3D. Driver Behavior

PART-TASK SIMULATION TRAINING OF DRIVERS' PASSING JUDGMENTS

R. Lucas, N. Heimstra, D. Spiegel 1973 3refs
Human Factors v15 n3 p269-74 (Jun 1973)

Driver performance, Decision making, Passing, Perception, Driver tests, Cinematographic simulation, Judgment, Variance analysis, Driver education simulation, Driving simulators

Thirty-two male subjects were pretested in an on-the-road situation requiring that they estimate the last possible moment for safely passing a lead vehicle in the face of an oncoming vehicle. The subjects were then exposed to a number of filmed scenes and again required to estimate the last possible safe moment for passing. Half the subjects received feedback concerning the accuracy of their estimates while the others did not. A posttest conducted on the road showed that there was a significant improvement in the performance of the group that had received feedback during the training session.
HS-013 407

DRIVER-VEHICLE CONTROL PERFORMANCE

General Motors Corp., Detroit, Mich.
R. T. Bundorf 1973 24p 18refs
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Vehicle handling, Driver vehicle interface, Accident causes, Man machine systems, Driver performance, Vehicle performance, Human factors, Environmental factors, Accident studies, Vehicle dynamics, Driver errors, Vehicle control, Performance tests, Test reproducibility, Driver modeling, Mathematical models, Accident avoidance, Defensive driving, Emergency training, Driver emergency responses

Group 3D—Driver Behavior

Handling from both vehicle and driver viewpoints is investigated. A brief review of relevant studies indicates that well maintained vehicles do not appear to be a significant factor in accident causation. Changes in the handling performance of current vehicles, unless truly innovative and interactive with other causation factors are therefore not likely to have significant impact in accident prevention. Various proposals for identifying and evaluating vehicle handling factors including General Motors (G.M.) driver-vehicle task performance approach to handling tests are discussed. Driver simulation experiments are reviewed which show the driver to be adaptive and to have the ability to control diverse dynamic systems. An advanced driver education curriculum in maneuvering skills developed by G.M., which holds promise as an effective accident countermeasure, is described.

HS-013 410

HIGHWAY SAFETY PROGRESS DURING RECENT YEARS

North Carolina Univ., Chapel Hill. Hwy. Safety Res. Center
For primary bibliographic entry see Fld. 2D.

HS-013 415

NATIONAL HIGHWAY SAFETY RESEARCH PRIORITIES PRIORITIES

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 4B.

HS-013 417

DRIVER FACTORS AND DRIVER MODELING AS THEY RELATE TO VEHICLE HANDLING RESEARCH

Systems Technology, Inc., Hawthorne, Calif.

D. H. Weir 1973 24p 29refs

Presented at Vehicle Safety Res. Integration Symposium,
Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

Driver modeling, Vehicle handling, Man machine systems, Driver vehicle interface, Human factors, Vehicle control, Driver behavior, Feedback control, Vehicle dynamics, Station wagons, Aerodynamics, Travel trailers, Mathematical analysis, Towing, Driving task analysis

Driver factors and models which relate to control of the vehicle along the roadway are considered. The modeling approach presented has an engineering orientation which has proved useful in quantifying driver/vehicle response and performance and solving design problems. Handling situations of interest include both the nominal and emergencies. These can involve discrete events and maneuvers as well as average behavior, and the corresponding control modes are a combination of open loop and closed loop operation. Important parameters can be classed according to vehicle properties, task variables, and driver-centered variables. The status and nature of pertinent driver models are briefly reviewed, and their applicability is noted. The describing function models which have been the most useful in vehicle handling applications are discussed in more detail. Specific applications of driver modeling to aerodynamic disturbance regulation and trailer towing are given. Example full scale data correlates are shown.

HS-013 431

OPEN- AND CLOSED-LOOP TESTING AND HOW THEY ARE INTEGRATED IN VEHICLE HANDLING AND DYNAMICS RESEARCH

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

For primary bibliographic entry see Fld. 5R.

HS-013 436

STRESS AND DRIVING: THE RELATIONSHIP BETWEEN LIFE CRISIS EXPERIENCES AND A SUDDEN DETERIORATION IN DRIVING RECORD

North Carolina Univ., Chapel Hill. Hwy. Safety Res. Center

P. F. Waller, J. P. Foley, D. W. Jeffrey 1972 137p 15refs

Corporate author

Stress (psychology), Driver behavior, Driver age, Driver sex, Racial factors, Accident factors, Driver records, Accident repeater drivers, Accident free drivers, Driver mileage, Commuting patterns, Travel patterns, Marital status, Driver educational levels, Driver physical fitness, Driver mental fitness, Socioeconomic data, Psychological factors, Driver performance under stress, Driver interviews, Questionnaires

The Crisis group in this study was made up of drivers whose records showed three consecutive years with no accidents or violations followed by a fourth year with at least three violations or three accidents. These drivers were compared with a control sample. Comparing telephone interviewed subjects, it was found that a greater proportion of crisis subjects reported an increase in the amount of driving done in the past year, while control subjects were more likely to report a decrease. Control subjects were more likely to be married. No differences were found in educational level, height, weight, or socioeconomic status. Crisis subjects were more likely to have experienced personal health problems. The life stresses distinguishing the crisis and control groups appear to be difficulty in interpersonal relationships, a decline in personal health, and/or feeling that there is no purpose in living.

HS-013 457

SYMPOSIUM ON PSYCHOLOGICAL ASPECTS OF DRIVER BEHAVIOUR, VOL. 1, NOORDWYKERHOUT, THE NETHERLANDS, AUGUST 2-6, 1971

111971 12560P REFS

Sponsored by the North Atlantic Treaty Organization. Includes
HS-013 462--HS-013 489.

Corporate author

Driver behavior research, Psychological factors, Driver vehicle interface, Driver performance, Driver behavior, Driving simulators, Simulation models, Driving task analysis, Driver simulation research, Driving simulation research, Research methods, Conferences, Driver evaluation devices, Human factors, Alcohol effects, Man machine systems, Perception, Decision making, Driver vehicle road interfaces, Driver modeling

The object of the symposium was to improve the communication between the field of driving task research, human performance theory, and research applied to the design of vehicle and road and to driver education. The symposium was organized into two divisions. The first division, covered in volume 1, provides a review of research on driver behavior and human performance theory with an eye for application of results. Personality assessment methods, aimed at predicting good and bad driver performance, and simulation techniques are emphasized.

HS-013 461

MOTIVATIONAL DETERMINANTS OF EXPERIMENTAL RISK-TAKING BEHAVIOUR

Vrije Univ., Amsterdam (Netherlands)

J. H. Andriessen 1971 16p 4refs

In HS-013 461, Symposium on Psychological Aspects of Driver Behaviour, Voorburg, 1971, v1, sect. I.0

Risk taking, Decision making, Psychological tests, Motivation, Psychological factors, Age factors, Learning rates, Fear, Perception, Behavior research, Motivation research

A decision-theoretical motivation model was used to analyze the interaction of variables such as ability, risk-perception, experience, and personality-variables as well as their influence on risky or safe behavior. The most important dependent variable was the choice between tasks which varied in success-probabilities and pay-off (money). The results indicated that in a novel situation, when there is only a small amount of information about situational parameters, variance in task(risk)-preferences is explained by individual ability, accuracy of risk perception, and interaction of personality-variables, such as, achievement motivation and fear of failure. After some experience with the task the influence of personality-variables disappears.

HS-013 462

SOME REMARKS ON THE EFFECT OF DRUGS, LACK OF SLEEP AND LOUD NOISE ON HUMAN PERFORMANCE

Rijkseverdedigingsorganisatie TNO, Soesterberg (Netherlands)

A. F. Sanders, A. A. Bunt 1971 20p 51refs

Research conducted under Institute for Road Safety Research SWOV contract EA-DG/JP-15114.

In HS-013 461, Symposium on Psychological Aspects of Driver Behaviour Voorburg, 1971 v1, sect. I.0

Drug effects, Amphetamines, Alcohol effects, Hypnotics, Sleep deprivation, Noise exposure, Time perception, Decision making, Human factors, Manual performance, Vigilance tasks, Memory, Behavior research

A survey of human performance in tests of time estimation, decision making, long term performance, and short term memory is presented. Amphetamine prevents deterioration in long term performance, whereas hypnotics and lack of sleep promote deterioration in such tasks. However, there are almost no effects on short lasting repetitive tasks or initial performance level in long term work. Hypnotics also inhibit organizational activity in some types of cognitive tasks, such as digit substitution and memory span. The studies on alcohol and noise indicate that much depends on dose, the specific properties of the task, and the interaction with other abnormal conditions. Systematic research on selective effects of abnormal conditions is difficult to realize in the absence of a satisfactory taxonomy of tasks.

HS-013 463

SOME GENERAL FEATURES OF PERCEPTUAL DISCRIMINATION

Adelaide Univ., S.A. (Australia)

D. Vickers 1971 20p 73refs

In HS-013 461, Symposium on Psychological Aspects of Driver Behaviour, Voorburg, 1971, v1, sect. I.0

Perception, Perceptual analysis, Psychophysical discrimination, Psychological factors, Psychological tests, Behavior research, Decision making

Models, including that of Cartwright and Festinger, the random walk, runs, and recruitment are described. Empirical evidence against which the models may be assessed is reviewed in terms of response frequency, latencies for correct and incorrect responses, studies of expanded judgment, confidence, and response force. It is argued that the results can be accounted for by an accumulator process, in which the subject makes a response when he has accumulated a certain magnitude of signal difference or intensity. The relation of this account to practical situations is briefly indicated.

HS-013 464

REVIEW OF AUTOMOBILE SIMULATOR RESEARCH

Rochester Univ., N.Y.

For primary bibliographic entry see Fld. 5D.

HS-013 465

THE AUTOMOBILE DRIVER AS A VARIABLE IN AN ENVIRONMENTAL SYSTEM

New Mexico Univ., Albuquerque

R. D. Campbell, L. E. Schlesinger, A. L. Roark 1971 20p 16refs

In HS-013 461, Symposium on Psychological Aspects of Driver Behaviour, Voorburg, 1971, v1, sect. I.1

Driver behavior, Man machine systems, Driver road interface, Driver vehicle interface, Driver vehicle road interfaces, Driver performance, Driver skills, Automobile design, Highway design, Roadside hazards, Traffic law enforcement, Mathematical models, Systems analysis, Environmental factors

Variables in the system are drivers, vehicles, highway geometry and materials, all of the artifacts added to highways to enhance design, the rules and regulations which govern highway use by driven vehicles and the means of enforcing those rules, various classes of off-highway environments, aspects of the natural environment, and states of the system, such as traffic and culture patterns. The problem is that most variables in the system are analyzed by experts in variable-related disciplines who rarely work together. So cars, highways, driver training programs, laws, and policies of law enforcement are designed independently of each other. This is not an efficient design process in the case of highways which will be used for many years without being redesigned. The nature of some of the problems is examined in a brief description of each variable.

HS-013 466

DRIVER PERFORMANCE MEASUREMENT RESEARCH. VOL. 1. FINAL TECHNICAL REPORT

Michigan State Univ., East Lansing

T. W. Forbes, R. O. Nolan, F. E. Vanosdall 1973 190p refs

Contract FH-11-7627

NTIS

Driver performance, Driver monitoring, Driver behavior, Driver education evaluation, Driver behavior research, Reviews, Driving task analysis, Driver records, Rural highways, Design of experiments, Variance analysis, Driver skills, Driver experience, Driver avoidance

Suitability or unsuitability (potential hazard and interference with other traffic) of driver behavior in changing traffic situations was rated by pairs of carefully trained observer/raters. This method was evaluated in four different studies and showed high reliability and validity. In two studies, new groups with driver education teaching background were trained as ob-

Group 3D—Driver Behavior

server/raters. The new observers reached the same high reliability and proficiency as the experienced raters. Minimum training required totaled six weeks (half-time), four weeks of orientation and field observation in groups, and two weeks of individual practice in rating subject drivers. The method will be valuable for research on small groups under controlled conditions to improve driver education, driver licensing, and other similar procedures.

HS-800 881

HUMAN FORCE CONSIDERATIONS IN THE FAILURE OF POWER ASSISTED DEVICES. FINAL REPORT

Man Factors, Inc., San Diego, Calif.

B. F. Pierce, W. E. Woodson, P. H. Selby 1973 140p 13refs

Rept. No. MFI-73-105

Contract DOT-HS-230-2-396

Report for 10 May 1972-22 Dec 1972.

NTIS

Braking, Steering, Pedal force, Steering force, Muscular forces, Power brakes, Brake failures, Power steering, Steering system failures, Female drivers, Strength (physiology), Test equipment, Test volunteers, Data processing, Compliance tests, Driver characteristics, Instrumented vehicles, Driver monitoring, Braking forces, Data acquisition, Questionnaires, Test facilities, Driver age, Human body height, Statistical analysis, Design standards, Human factors, Power loss

A study was conducted to determine the physical effort automobile drivers can exert on brake pedals and steering wheels when power assist systems have failed. Data were recorded on the performance of 182 female test subjects under three different vehicle conditions: vehicle stationary, power-assist off; vehicle driven through a planned series of turns and stops, with surprise power-assist failures; and repeat of forewarned power-assist failures. For both steering and braking, the greatest forces were exerted with the vehicle in a stationary position and less force was exerted during the surprise condition than during the forewarned condition. It is recommended that 65 lbs. be the maximum force required to obtain full braking during a power system failure and that 15 lbs. be the maximum force required to turn a steering wheel at any rate when the power steering system has failed.

HS-800 889

3E. Driver Education

DRIVER PERFORMANCE MEASUREMENT RESEARCH. VOL. 1. FINAL TECHNICAL REPORT

Michigan State Univ., East Lansing

For primary bibliographic entry see Fld. 3D.

HS-800 881

3F. Driver Licensing

VISION AND HIGHWAY SAFETY: AN OVERVIEW SINCE 1962

For primary bibliographic entry see Fld. 3L.

HS-013 422

3G. Drugs Other Than Alcohol

SOME REMARKS ON THE EFFECT OF DRUGS, LACK OF SLEEP AND LOUD NOISE ON HUMAN PERFORMANCE

Rijkseverdedigingsorganisatie TNO, Soesterberg (Netherlands)

For primary bibliographic entry see Fld. 3D.

HS-013 463

3H. Environmental Effects

TECHNOLOGY ASSESSMENT--HOW DID WE GET HERE? WHERE ARE WE NOW? WHERE ARE WE HEADING?

Battelle Memorial Inst., Columbus, Ohio

For primary bibliographic entry see Fld. 4D.

HS-013 442

NEW TECHNOLOGIES AND THE ENERGY CRISIS

Energy Policy Proj.

J. F. Weinhold 1973 4p Rept. No. SAE-730447

Presented at Earthmoving Industry Conference, Central Illinois Section, Peoria, 2-4 Apr 1973.

SAE

Energy conservation, Technology, Mining, Energy consumption, Environmental planning, Coal, Crude oil, Natural gas, Uranium, Shales

The energy crisis and the earthmoving industry's relationships to it are considered. The crisis is not one problem but a series of immediate issues involving economics and institutional change coupled with longer term issues of environmental degradation and resource depletion. New technologies for energy supply coupled with better utilization of existing supplies provide the long term answer.

HS-013 446

DESCRIPTION AND USE OF A MEASUREMENT SYSTEM FOR AIR BAG ACOUSTIC TRANSIENT DATA ACQUISITION AND ANALYSIS. FINAL REPORT

Aerospace Medical Res. Lab., Wright-Patterson AFB, Ohio

For primary bibliographic entry see Fld. 5N.

HS-013 458

THE AUTOMOBILE DRIVER AS A VARIABLE IN AN ENVIRONMENTAL SYSTEM

New Mexico Univ., Albuquerque

For primary bibliographic entry see Fld. 3D.

HS-013 466

3K. Pedestrians

PEDESTRIAN SAFETY FOR URBAN STREETS, VOL. 1. FINAL REPORT

San Jose Dept. of Public Works, Calif.

L. B. Walsh 1972 493p refs

Sponsored by California Office of Traf. Safety and National Hwy. Traf. Safety Administration.

NTIS

Pedestrian safety, Pedestrian education, Safety programs, Public information programs, Pedestrian accidents, Accident analysis, San Jose (Calif.), Child safety education, Community support, Safety campaigns, Press releases, Radio programs, Television, Safety propaganda, Safety program effectiveness, Program evaluation, Accident statistics, Pedestrian injuries, Pedestrian fatalities, Accident factors, Pedestrian characteristics, Pedestrian behavior, Driver characteristics, Driver behavior, Pedestrian age, Reviews, Traffic control warrants, Accident prevention

Through its Pedestrian Safety Project, the City of San Jose has demonstrated that pedestrian accidents can be prevented through a program of public safety education. The development of this planned program of public safety education and the development of its educational activities and materials are documented. An analysis of pedestrian accidents in San Jose and a review of existing pedestrian safety programs and materials are presented. Initial and continuing program development and implementation activities are outlined. An evaluation of the project indicates that all the objectives of the project—reduction of pedestrian accidents, creation of a climate of public support and cooperation towards better pedestrian conduct, and provision of guidelines for other communities—have been accomplished.

HS-845 009

3L. Vision

VISION AND HIGHWAY SAFETY: AN OVERVIEW SINCE 1962

P. L. Connolly 1973 10p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Author

Driver vision standards, Visibility, Field of view, Eye movements, Driver monitoring, Peripheral vision, Visual fields, Visual perception, Instrument panel lighting, Rearview mirrors, Vision tests, Driver license examination, Visual acuity, Highway lighting, Pavement edge markings, Sign uniformity, Photography, Slides (visual aids)

When public awareness of highway safety needs reached its heights after 1962, recommendations for improvement of the visual features of the highway, the vehicle, and the driver increased. Eye cameras have been developed to measure driver eye movements and denote the driver's central vision fixation from moment to moment. Highway signs should be placed in this central visual attention area. Increased emphasis is now placed upon driver vision tests and improved highway signing and lighting and pavement edge markings. It is also important to study the driver's peripheral vision, by which he perceives the speed and directional characteristics of the vehicle, and to determine how the brain interprets what the driver sees. Night and rear visibility must be increased for greater safety.

HS-013 422

4. OTHER SAFETY-RELATED AREAS

4B. Community Support

NATIONAL HIGHWAY SAFETY RESEARCH PRIORITIES PRIORITIES

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

R. L. Hess 1973 11p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Safety research, Driver behavior research, Crashworthiness, Injury research, Budgets, Program evaluation, Highway safety programs, Safety program effectiveness, Priorities

National highway safety research priorities are examined as opposed to national highway safety action programs. An argument is made that adequate knowledge for the problem solution could be, but is not currently being, generated. It is recommended that research priority umbrellas, with significant long-term support, be established with goals in the areas of driver behavior modification, vehicle system crashworthiness, trauma management, and resource allocation. More attention should be given to full system research without prior decision of the ultimate action program nature—thus removing the needed research from program advocacy.

HS-013 417

A CRITIQUE OF VEHICLE SAFETY PROGRAMS FROM THE VIEWPOINT OF A CONSUMER ADVOCATE

Center for Auto Safety

For primary bibliographic entry see Fld. 4D.

HS-013 429

PEDESTRIAN SAFETY FOR URBAN STREETS, VOL. 1. FINAL REPORT

San Jose Dept. of Public Works, Calif.

For primary bibliographic entry see Fld. 3K.

HS-845 009

4C. Cost Effectiveness

DEVELOPMENT OF ADVANCED DEPLOYABLE RESTRAINTS AND INTERIORS

For primary bibliographic entry see Fld. 5N.

HS-013 430

VCON 3006 TRUCK--EXTENDING TIRE CAPACITY THROUGH INNOVATION

Peerless Mfg. Co., Dallas, Tex.

For primary bibliographic entry see Fld. 5T.

HS-013 443

HELICOPTER SERVICES STUDY. FINAL REPORT 111972 12447P 20REFS

Sponsored by National Hwy. Traf. Safety Administration. NTIS

Helicopters, Aerial surveillance, Police vehicles, Emergency vehicles, California, Peak hour traffic control, Traffic law enforcement, Transportation of injured, Stolen vehicles, Automobile identification, Police traffic services, Traffic surveillance, Urban areas, Rural areas, Month, Traffic control costs, Patrolling, Vehicle operating costs, Benefit cost analysis, Police training, Radios, Vehicle maintenance, Abandoned vehicles, Radio communication, Disabled vehicles, Crowd management, Manuals, Pilots, Aircrew selection, Vehicle inspection, Vehicle usage, Insurance, Traffic delay minimization, Time of day, Program evaluation

Group 4C—Cost Effectiveness

Two helicopters were utilized in the San Francisco Bay and Indio Desert areas to determine the use of the helicopter as a patrol vehicle, as a vehicle for special missions, as an emergency transportation vehicle, and as a commuter traffic surveillance platform. The patrol phase, which involved enforcement surveillance and response to motorist demands, was effective only in the Indio Area. The scheduled special missions phase involved auto theft investigation, disaster surveillance, monitoring of demonstrations, and aerial photography. The helicopter's effectiveness in this area has not yet been evaluated. Helicopters were most effective in providing emergency transportation. The Bay Area helicopter was used for peak hour traffic surveillance for a three month period during which time 869 incidents, primarily involving aid to stalled vehicles, were acted upon. A benefit cost analysis of helicopter services was performed. Pilot and observer selection and training and helicopter services manuals are included.
HS-845 008

4D. Governmental Aspects**HIGHWAY SAFETY PROGRESS DURING RECENT YEARS**

North Carolina Univ., Chapel Hill. Hwy. Safety Res. Center
For primary bibliographic entry see Fld. 2D.
HS-013 415

A CRITIQUE OF VEHICLE SAFETY PROGRAMS FROM THE VIEWPOINT OF A CONSUMER ADVOCATE

Center for Auto Safety
L. Dodge 1973 21p 26refs
Presented at Vehicle Safety Res. Integration Symposium,
Washington, D.C. 30-31 May 1973.
GPO in the Symposium Proceedings

Safety research, Program evaluation, Vehicle safety standards, National Hwy. Traf. Safety Administration, Rule making, Budgets, Consumer protection, Planning, Research dissemination, Data acquisition, National Traffic and Motor Vehicle Safety Act of 1966

The Congressional mandate authorizing the Secretary of Transportation to engage in vehicle safety research is discussed and the performance of the National Highway Traffic Safety Administration's (NHTSA) Research Institute is measured against that mandate. The strengths and weaknesses of the current vehicle safety research program, as seen from a consumer viewpoint, are described and briefly analyzed. It is recommended that NHTSA establish mechanisms to ensure utilization of research findings in improving safety standards; give more visibility to significant research findings, eliminate research programs which perform work or develop knowledge or techniques for which responsibility under the National Traffic and Motor Vehicle Act of 1966 is assigned to industry; place more emphasis on data acquisition and analysis; and reassess the current emphasis on research directed at behavior modification.
HS-013 429

TECHNOLOGY ASSESSMENT--HOW DID WE GET HERE? WHERE ARE WE NOW? WHERE ARE WE HEADING?

Battelle Memorial Inst., Columbus, Ohio
G. Strasser 1973 4p Rept. No. SAE-730109

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.
SAE

Technology, Assessments, Federal role, Environmental quality

In 1972, the Office of Technology Assessment (OTA) was created within the Congress of the United States as a result of the increasing complexity of technology and public awareness of the environmental impact of technology and insistence that this impact be regulated. The OTA consists of a 13 member Technology Assessment Board, including six Senators and six Congressmen, equally divided among Democrats and Republicans. The role of the Board and the institutional anchoring and the expected means by which OTA will establish its credibility are outlined.
HS-013 442

4E. Information Technology**NATIONAL ACCIDENT DATA SYSTEM**

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 1C.
HS-013 416

4G. Mathematical Sciences**SIMULATION--ADVANTAGES AND DISADVANTAGES [AND] AUTOMOTIVE RECORDER RESEARCH PROGRAM**

Department of Transp., Washington, D.C.
G. G. Mannella 1973 6p
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Author

Mathematical models, Simulation models, Computerized safety research techniques, Accident simulation, Crashworthiness, Biomechanics, Occupant modeling, Occupant kinematics, Restraint systems, Computerized simulation, Vehicle handling, Validation, Recorders, Data acquisition, Accident research, National Highway Traffic Safety Administration, Design of experiments, Crash phase, Precrash phase, Accident simulation, Impact velocity, Acceleration, Fleets

The use of mathematical simulation techniques in automotive safety programs fall into four primary categories: vehicle crash dynamics, biomechanics, restraint systems, and vehicle handling. The application, advantages, and disadvantages of each of these simulation techniques are presented. As new developments and refinements of the simulation programs are validated against test data and the accuracies of the models are confined beyond reproach, it will be possible to evaluate the various safety factors of new cars before they leave the drawing boards. This will allow safer cars to be built from the ground up rather than be an amalgamation of add-on pieces designed to cure problems of an inappropriate design. The Automotive Recorded Research Program is described and its objectives explained: to assess present vehicle safety standards; to correlate accident severity with occupant injuries and fatalities; to assess driver performance under real-world conditions; to study future accident avoidance and crash survivability vehicle safety standards; and to determine the relative importance of contributory factors in accident causation and severity. Each objective is linked to the study of its appropriate countermeasure.
HS-013 421

BIOMECHANICS AND CRASH SURVIVABILITY

Federal Aviation Administration, Washington, D.C.

For primary bibliographic entry see Fld. 1B.

HS-013 427

DRIVER FACTORS AND DRIVER MODELING AS THEY RELATE TO VEHICLE HANDLING RESEARCH

Systems Technology, Inc., Hawthorne, Calif.

For primary bibliographic entry see Fld. 3D.

HS-013 431

MODELING AND SIMULATION IN VEHICLE HANDLING RESEARCH

For primary bibliographic entry see Fld. 5R.

HS-013 433

MODELING AND SIMULATION AS APPLIED TO VEHICLE STRUCTURES AND EXTERIORS

Michigan Univ., Ann Arbor

For primary bibliographic entry see Fld. 5D.

HS-013 434

MOTORCYCLE CRASH SAFETY RESEARCH

Denver Univ., Colo.; Caliber Design Ltd., Stratford (England)

For primary bibliographic entry see Fld. 5C.

HS-013 435

PARTICULAR HANDLING SAFETY PROBLEMS OF TRUCKS AND ARTICULATED VEHICLES

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-013 437

VCON 3006 TRUCK--EXTENDING TIRE CAPACITY THROUGH INNOVATION

Peerless Mfg. Co., Dallas, Tex.

For primary bibliographic entry see Fld. 5T.

HS-013 443

DESIGN FOR GRAPHICS

Stanford Univ., Calif.

W. J. Bowman 1973 31p Rept. No. SAE-730411

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

SAE

Graphic techniques, Visual aids, Graphs, Charts

This paper identifies in logical order some of the major message functions of graphic language, and develops these functions in terms of specific communicative options available to the designer.

HS-013 444

DYNAMIC BEHAVIOR OF RECREATIONAL VEHICLES DURING BRAKING AND STEERING

Bendix Corp., Southfield, Mich.; Bendix Res. Labs.

For primary bibliographic entry see Fld. 5T.

HS-013 447

THE EFFECT OF CRASHWORTHINESS PARAMETER VARIATION ON ESV WEIGHT

American Machine and Foundry Co., Santa Barbara, Calif.

For primary bibliographic entry see Fld. 5D.

HS-013 450

HEAT TRANSFER RATES AT GAS-WALL INTERFACES IN MOTORED PISTON ENGINE

Phu Tho Technical Center (South Vietnam); Wisconsin Univ., Madison

For primary bibliographic entry see Fld. 5D.

HS-013 455

SYMPOSIUM ON PSYCHOLOGICAL ASPECTS OF DRIVER BEHAVIOUR, VOL. 1, NOORDWYKERHOUT, THE NETHERLANDS, AUGUST 2-6, 1971

111971 12560P REFS

Sponsored by the North Atlantic Treaty Organization. Includes

HS-013 462--HS-013 489.

Corporate author

Driver behavior research, Psychological factors, Driver vehicle interface, Driver performance, Driver behavior, Driving simulators, Simulation models, Driving task analysis, Driver simulation research, Driving simulation research, Research methods, Conferences, Driver evaluation devices, Human factors, Alcohol effects, Man machine systems, Perception, Decision making, Driver vehicle road interfaces, Driver modeling

The object of the symposium was to improve the communication between the field of driving task research, human performance theory, and research applied to the design of vehicle and road and to driver education. The symposium was organized into two divisions. The first division, covered in volume 1, provides a review of research on driver behavior and human performance theory with an eye for application of results. Personality assessment methods, aimed at predicting good and bad driver performance, and simulation techniques are emphasized.

HS-013 461

THE AUTOMOBILE DRIVER AS A VARIABLE IN AN ENVIRONMENTAL SYSTEM

New Mexico Univ., Albuquerque

For primary bibliographic entry see Fld. 3D.

HS-013 466

BASIC RESEARCH IN CRASHWORTHINESS 2--DYNAMIC ANALYSIS OF ELASTO-PLASTIC SPACE FRAME STRUCTURES. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

For primary bibliographic entry see Fld. 5D.

HS-800 885

BASIC RESEARCH IN CRASHWORTHINESS 2--EXPERIMENTAL VALIDATION STUDY FOR THE LARGE DEFLECTION DYNAMIC ANALYSIS OF PLANE ELASTO-PLASTIC FRAME STRUCTURES. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

For primary bibliographic entry see Fld. 5D.

HS-800 886

Group 5A—Brake Systems

5. VEHICLE SAFETY

HIGHWAY SAFETY PROGRESS AS REFLECTED IN ACCIDENT DATA

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 1E.
HS-013 414

5A. Brake Systems

WHEEL LOCK CONTROL BRAKING SYSTEMS

General Motors Corp., Detroit, Mich.
G. P. Baynes 1973 9p
Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.
Corporate author

Antilocking devices, Wheel slip control, Brake performance, Brake torque, Braking optimization, Electronic braking, Speed sensors, Modulators, Braking forces, Stopping distance, Control equipment

Because of all the variables affecting braking output distribution; namely, weight, weight shift, deceleration rate, road coefficient, tire condition, and lining coefficient, considerable driver skill is required to modulate brake pedal force, to obtain short stops, or to develop the changing pressure to give optimum brake torque and simultaneously maintain lateral control. Further, the driver is unable to control front to rear brake torque variation needed to obtain optimum stop. A rear wheel lock control system which gives attitude stability during maximum deceleration stops; front to rear balance; and may also improve stopping distances is briefly described. The wheel lock control system consists of an electrical wheel speed sensor, an electrical controller, and a modulator, tied together with a wiring harness. The recent developments of probe type sensors, simpler kinds of electronic circuitry, and simpler types of modulators indicate significant reduction in complexity and increased reliability of these units.
HS-013 423

MODELING AND SIMULATION IN VEHICLE HANDLING RESEARCH

For primary bibliographic entry see Fld. 5R.
HS-013 433

HUMAN FORCE CONSIDERATIONS IN THE FAILURE OF POWER ASSISTED DEVICES. FINAL REPORT

Man Factors, Inc., San Diego, Calif.
For primary bibliographic entry see Fld. 3D.
HS-800 889

5C. Cycles

MOTORCYCLE CRASH SAFETY RESEARCH

Denver Univ., Colo.; Caliber Design Ltd., Stratford (England)
H. C. Peterson, P. W. Bothwell, R. E. Knight 1973 36p
Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

tank caps, Crashworthy fuel tanks, Seat anchorages, Head on impact tests, Impact angle, Rear end impact tests, Barrier collision tests, Vehicle vehicle impact tests, Side impact tests, Skidding, Anthropometric dummies, Air bag restraint systems, Restraint system effectiveness, Motorcycle restraint systems, Computerized simulation, Mathematical models, Reviews, Test tracks, Instrumentation, Digital computers

Research conducted on the dynamics of motorcycle impact is reviewed. Twenty-seven head on, 67 1/2 angled barrier, side, and motorcycle automobile impact tests; and skidding and sliding tests were performed using anthropometric dummies. Test results indicate the need for crashworthy fuel tanks, elimination of flip top fuel tank caps and lacerating projections, breakaway windshields, footrests designed to survive a 30 mph slide on concrete, stronger seat anchorages, relocation of ignition coils as far as possible from the fuel tank, and improved crash bars. Procedures and results of 13 impact tests and the development of a digital computer simulation of the postcrash motion of a dummy rider and a motorcycle are discussed. The effectiveness of air bag restraint systems in preventing injuries in motorcycle crashes is evaluated.
HS-013 435

5D. Design

NATIONAL HIGHWAY SAFETY RESEARCH PRIORITIES PRIORITIES

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
For primary bibliographic entry see Fld. 4B.
HS-013 417

OCCUPANT PROTECTION RESEARCH NEEDS

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 5N.
HS-013 419

SIMULATION--ADVANTAGES AND DISADVANTAGES [AND] AUTOMOTIVE RECORDER RESEARCH PROGRAM

Department of Transp., Washington, D.C.
For primary bibliographic entry see Fld. 4G.
HS-013 421

ANTICIPATORY SENSORS FOR COLLISION AVOIDANCE AND CRASH PREDICTION AS APPLIED TO VEHICLE SAFETY RESEARCH

Department of Transp., Cambridge, Mass. Transp. Systems Center
J. B. Hopkins 1973 41p 15refs
Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

Sensors, Accident avoidance, Sonics, Radar, Automatic braking, Target detection, Radiation hazards, Safety device costs, Vehicle trajectories, Automatic steering control, Road curves, Systems analysis, Doppler effect, Range effect, Noise control, Passive restraint systems

Radar crash prediction with good accuracy appears to be technically feasible at a moderate cost. However, ultimate risk

crashworthiness, and developments in bumper-mounted sensors and more rapid deployment of restraint systems. Technical difficulties involving target discrimination, out-of-lane targets, curves, evasive maneuvers, intervehicle interference, dynamic range, and blinding increase sharply with the desired range of the system. A system designed only for emergency operation, intended only to apply full braking at the last possible time, and thereby with the shortest possible sensing distance, appears to be optimal in terms of both accident reduction and driver acceptability. Radar steering would require greater sensing distances to allow several seconds for necessary perception, decision, and action. A high percentage of false alarms could damage credibility.

HS-013 428

HARDWARE DEVELOPMENT AND PRODUCTION FEASIBILITY AS RELATED TO VEHICLE STRUCTURES AND EXTERIORS RESEARCH

Calspan Corp., Buffalo, N.Y.

P. M. Miller 1973 38p 34refs

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.

GPO in the Symposium Proceedings

Crashworthiness, Body design, Safety design, Energy absorbing systems, Automobile modification, Passenger compartments, Side impact tests, Rear end impact tests, Pole impact tests, Vehicle vehicle impact tests, Impact velocity, Vehicle size, Vehicle weight, Head on impact tests

In developing crashworthy automobile structures emphasis should be placed on front, side, and rollover collisions where impact speeds exceed the limits of current structural adequacy. Structural crashworthiness research on full size, luxury, compact, and subcompact automobiles is reviewed. Research has progressed to the point with full size automobiles where the remaining problems are essentially related to manufacturing weight control, and operational performance. Equal protection for occupants of small and large cars can be obtained only if the small car is designed to provide protection throughout a greater speed range than the larger car. However, it is unlikely that this will occur, and consequently, occupants of small cars must accept a greater risk than occupants of larger cars.

HS-013 432

MODELING AND SIMULATION AS APPLIED TO VEHICLE STRUCTURES AND EXTERIORS

Michigan Univ., Ann Arbor

I. K. McIvor 1973 27p 15refs

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973. Paper based on study conducted under contract DOT-HS-031-2-481.

GPO in the Symposium Proceedings

Computerized simulation, Structural deformation analysis, Simulation models, Accident simulation, Mathematical models, Crash response forecasting, State of the art studies, Degrees of freedom, Finite element method, Displacement, Deceleration, Deformation, Acceleration, Evaluation, National Hwy. Traf. Safety Administration, Crush tests, Computer programs

Computer simulation programs to model the structural response during vehicle impact are reviewed relative to the needs of the National Highway Traffic Safety Administration. A simulation spectrum of sufficient breadth to cover these needs is defined. The spectrum is typified by five levels of simulation from sim-

ple qualitative models to quantitative models giving complete pointwise time histories. The capabilities and limitations of simulation programs considered—qualitative spring-mass models, colinear lumped mass models, and a variety of frame models based on both plastic hinge and finite element concepts—are presented and related to the defined simulation spectrum. Although qualitatively meaningful simulations are well established, it is concluded that only minimal quantitative results are achievable within the current state of the art. Requirements and feasibility of developing advanced level simulations are delineated. Problem areas requiring further research are joint behavior, local deformation, strain rate sensitivity, load transmission characteristics, and numerical error control.

HS-013 434

MOTORCYCLE CRASH SAFETY RESEARCH

Denver Univ., Colo.; Caliber Design Ltd., Stratford (England)

For primary bibliographic entry see Fld. 5C.

HS-013 435

LABORATORY POWER TRAIN TESTING USING FIELD RECORDED LOADS

Deere and Co., Dubuque, Iowa

P. D. Clark, D. E. Roen 1972 8p 1ref Rept. No. SAE-730412

Presented to Society of Automotive Engineers Mississippi Valley Section, Dubuque, 27 Apr 1972.

SAE

Power trains, Laboratory tests, Loading (mechanical), Torque, Field tests, Test equipment, Hydraulic equipment, Durability tests, Accelerated tests, Tape recordings, Servomechanisms

A system has been developed to load the power train of a lab test vehicle with field recorded torques. This loading is accomplished with hydraulically activated axle load brakes which are controlled by an electro-hydraulic servo system. The entire power train is then tested as though the tractor was operating in the field. The advantages of the test system include 24 h/day operation regardless of weather conditions and very consistent day to day loading of the test vehicle. A description of the power train test system is presented.

HS-013 445

HEAT RESISTANCE OF CHLOROSULFONATED POLYETHYLENE AND POLYCHLOROPRENE

Du Pont de Nemours (E. I.) and Co., Wilmington, Del.

I. C. Dupuis 1973 8p 4refs

Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.

SAE

Heat resistance, Polyethylene, Thermal degradation, Polymers, Vulcanizing, Elongation, Metal oxides

Elastomeric vulcanizates of chlorosulfonated polyethylene (CSM) exhibit wide variations in heat resistance. Differences also occur among polychloroprene (CR) vulcanizates. These differences in heat resistance are related to compounding variables. For both CR and CSM, a minimum of polymer dilution with fillers and heat stable plasticizers is necessary. Other critical variables include the proper selection of metal oxides and antidegradants. Using an absolute elongation at break of 100% as the index or end-point of elastomeric utility, the best heat resistant CSM vulcanizate has approximately 28 Centigrade

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degrees (50F) greater thermal stability than the best heat resistant CR vulcanizate. Heat resistant vulcanizates of CSM vary in thermal stability by 20-22 Centigrade degrees (36-40F), depending on their makeup. When air oven aged at constant temperature, differences of 3- to 5-fold in the time to reach 100% elongation are shown for CSM and for CR vulcanizates. HS-013 448

THE EFFECT OF CRASHWORTHINESS PARAMETER VARIATION ON ESV WEIGHT

American Machine and Foundry Co., Santa Barbara, Calif.
R. E. Kazares 1973 17p 3refs Rept. No. SAE-730588
Contract DOT-HS-257-2-514
Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.
SAE

Safety cars, Vehicle weight, Crashworthiness, Computerized safety research techniques, Computerized simulation, Kinetic energy, Mathematical models, Barrier collision tests, Pole impact tests, Side impact tests, Rear end impact tests, Vehicle vehicle impact tests, Front end impact tests, Impact angle, Crashworthy bodies, Safety design, Moments of inertia, Vehicle design, Vehicle classification

An analytical model has been generalized so that any set or combination of parametric variations of crashworthiness requirements as well as any set or combination of resultant subsystem vehicle weights can be exercised. The computer routines can handle two types of subsystem weight variation. The first is direct coupling of crashworthy structural weight to impact kinetic energy levels. The second type is the coupling of one subsystem weight to another. The functional weight of the optimized vehicle is 4,223 lb., and meets the crash performance requirements at 27 mph for frontal impacts, 11 mph for side pole impacts, 20 mph for side car impacts, and 24 mph for rear moving barrier impacts. HS-013 450

HEAT TRANSFER RATES AT GAS-WALL INTERFACES IN MOTORED PISTON ENGINE

Phu Tho Technical Center (South Vietnam); Wisconsin Univ., Madison
K. Dao, O. A. Uyehara, P. S. Myers 1973 23p 11refs Rept. No. SAE-730632
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Heat transfer, Gas motion, Combustion chamber swirl, Heat flux, Cylinder gases, Thermal conductivity, Engine speeds, Compression ratio, Cylinder pressure, Intake manifold pressures, Diesel engines, Single cylinder engines, Pistons, Mathematical models

The influence on heat fluxes of engine speed, compression ratio, intake pressure, swirl ratio, location on the cylinder head surface, and the shape of the piston top is examined. Equations are given to show the method of calculation used in deriving the data on heat transfer rates. HS-013 455

A TURBOCHARGED SPARK IGNITION ENGINE WITH LOW EXHAUST EMISSIONS AND IMPROVED FUEL ECONOMY

Michigan Technological Univ., Houghton

J. F. Schweikert, J. H. Johnson 1973 16p 11refs Rept. No. SAE-730633
Presented at Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, 18-22 Jun 1973.
SAE

Spark ignition engines, Turbocharging, Exhaust gas recirculation, Engine speeds, Hydrocarbons, Carbon monoxide, Nitrogen oxides, Thermal reactors, Exhaust emission tests, Exhaust emission measurement, Fuel economy, Fuel consumption, Exhaust emission sampling, V 8 engines, Engine performance

When comparing a turbocharged engine to a larger displacement naturally aspirated engine of equal power output, the emissions expressed in grams per mile were relatively unchanged both with and without exhaust gas recirculation (EGR). However, turbocharging provided an average of 20% improvement in fuel economy both with and without EGR. When comparing the turbocharged and nonturbocharged versions of the same engine without EGR at a given load and speed, turbocharging increased the hydrocarbon (HC) and carbon monoxide (CO) emissions and decreased oxides of nitrogen (NOx) emissions. With the addition of EGR, turbocharging increased all three emissions. When comparing turbocharged and nonturbocharged engines of equal displacement on the heavy-duty 13-mode dynamometer cycle, turbocharging reduced CO emissions and increased the HC and NOx emissions both with and without EGR. HS-013 456

SYMPOSIUM ON PSYCHOLOGICAL ASPECTS OF DRIVER BEHAVIOUR, VOL. 1, NOORDWYKERHOUT, THE NETHERLANDS, AUGUST 2-6, 1971 111971 12560P REFS

Sponsored by the North Atlantic Treaty Organization. Includes HS-013 462--HS-013 489.
Corporate author

Driver behavior research, Psychological factors, Driver vehicle interface, Driver performance, Driver behavior, Driving simulators, Simulation models, Driving task analysis, Driver simulation research, Driving simulation research, Research methods, Conferences, Driver evaluation devices, Human factors, Alcohol effects, Man machine systems, Perception, Decision making, Driver vehicle road interfaces, Driver modeling

The object of the symposium was to improve the communication between the field of driving task research, human performance theory, and research applied to the design of vehicle and road and to driver education. The symposium was organized into two divisions. The first division, covered in volume 1, provides a review of research on driver behavior and human performance theory with an eye for application of results. Personality assessment methods, aimed at predicting good and bad driver performance, and simulation techniques are emphasized. HS-013 461

REVIEW OF AUTOMOBILE SIMULATOR RESEARCH

Rochester Univ., N.Y.
G. V. Barrett 1971 20p 65refs
In HS-013 461, Symposium on Psychological Aspects of Driver Behaviour, Voorburg, 1971, v1, sect. 1.1

Driving simulation research, Driving simulators, Driving task analysis, Driving simulation, Display systems, Television, Drug effects, Driver performance, Reviews

Information on type of simulation, research focus, variables measured, and fidelity of simulation is presented for simulators with inside-out and outside-in visual displays. A wide variety of visual displays have been employed including TV projected image; TV virtual image; TV monitors; direct optical; film; computer generated car on moving belt; and point light source rear projection. The research focus is usually on four topics: the effect of drugs upon driver performance; the relationship between driver performance in simulated and real world situations; comparison of drivers with different characteristics; and driver response as a function of equipment. The scientific equivalence between simulated and real world driving is a basic problem. There are methodological, statistical, and empirical issues which place in question many driver simulation studies. Future research should provide more information on the fidelity and validity of simulation.

HS-013 465

BASIC RESEARCH IN CRASHWORTHINESS 2--FURTHER REFINEMENT IN ENGINE DEFLECTION CONCEPT. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

P. M. Miller 1973 556p 10refs Rept. No. YB-2987-V-18

Contract FH-11-7622

NTIS

Crashworthy bodies, Engine deflection, Energy absorbing front structures, Automobile modification, Occupant kinematics, Vehicle kinematics, Restraint system effectiveness, Frame design, Bumper design, Passenger compartments, Body mounting, Fire walls, Pillars, Fenders, Grilles, Hoods, Low speed impact tests, Air bag restraint systems, Three point restraint systems, Pole impact tests, Barrier collision tests, Polyurethane foams, High speed impact tests, Impact velocity, Chest acceleration tolerances, Head acceleration tolerances, Pelvic acceleration tolerance, Side impact tests, Vehicle vehicle impact tests, Impact angle, Head on impact tests, Crush distance, Dummies, Severity indexes, Instrumentation, Acceleration response, Loading (mechanical), Femurs

An engine deflection, front structural modification to a full size automobile is refined using normal automobile materials in the structure. The refinement includes a significant weight decrease from that utilized on the original concept. Provisions were made for all normal operational requirements. Structural performance of the originally modified vehicles during barrier collision and pole impact tests was maintained with the refined vehicles. Additional data were obtained for vehicle vehicle impact tests involving side and head on impacts between full size automobiles. In addition to results for numerous low speed impacts, data on the performance of the modified front structure during twelve tests where impact speed ranged from 30 mph to 60 mph were developed. Dummy acceleration response and the effectiveness of air bag and three point restraint systems were measured.

HS-800 868

BASIC RESEARCH IN CRASHWORTHINESS 2--DEVELOPMENT AND EVALUATION OF STRUCTURAL MODIFICATIONS FOR LUXURY

CARS IN FRONTAL IMPACTS. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

E. H. Johnson 1973 112p 6refs Rept. No. YB-2987-V-6

Contract FH-11-7622; Ref: Contract FH-11-6918

NTIS

Crashworthiness, Automobile modification, Luxury automobiles, Pole impact tests, Structural design, Structural deformation analysis, Head on impact tests, Dynamic structural analysis, Collapse, Buick Electra, Crashworthy bodies, Energy absorbing bumpers, Safety design, Engine deflection, Vehicle weight, Aluminum, Angle impact tests, High speed impact tests, Low speed impact tests, Crush distance, Accelerometers, High speed photography, Test equipment, Displacement, Deceleration, Acceleration, Energy absorbing front structures

Pole impact tests at 60 mph were conducted using one base line and three modified Buick Electra 225's. A low speed impact test was also conducted. The primary modifications were the addition of collapsing structural members in the front of the vehicle and the installation of a ramp that deflected the engine under the car. The aim of these modifications was to produce a high level sustained structural collapse load and to limit any penetration of the passenger compartment to a minimum. The first two modified vehicles demonstrated significant improvement over the base line and came close to achieving the design goals. The third modification revealed a number of design flaws. In general, it was concluded that modifications made on standard size vehicles are directly applicable to luxury cars so that a concentration on standard size vehicles will provide information of benefit to both classes of vehicles.

HS-800 872

BASIC RESEARCH IN CRASHWORTHINESS 2--DEVELOPMENT AND TESTING OF VEHICLE SIDE STRUCTURE MODIFICATIONS. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

J. E. Greene 1973 350p 4refs Rept. No. YB-2987-V-14

Contract FH-11-7622

NTIS

Crashworthiness, Automobile modification, Crashworthy bodies, Vehicle vehicle impact tests, Side impact tests, Safety design, Structural deformation analysis, Body design, Frame design, Pole impact tests, Lateral acceleration, Occupant protection, Acceleration response, Pillars, Door design, Roll bars, Vehicle weight, Impact protection, Energy absorption, Structural analysis, Plastic hinges, Padding, Anthropometric dummies, Test equipment, Data processing, Vehicle kinematics, Human acceleration tolerances, Angle impact tests, Glazing materials, Materials tests

Structural modifications were developed for full-size, frame chassis automobiles. These modifications involved redesign of the side pillar, door, roof, and frame structure to increase intrusion resistance of the occupant compartment, and to more effectively dissipate crash energy. The side structure designs are compatible with front structure modifications also developed by Calspan in a parallel effort, resulting in a unified front/side structural concept. Weight increases associated with the modification were on the order of 250 to 275 lbs. Vehicles incorporating side structure modifications were subjected to extensive crash testing, which included perpendicular and oblique vehi-

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cle-to-vehicle side collisions at speeds up to 45 mph, and lateral impacts against a narrow fixed object at 21 mph. Side impacts by both conventional and modified front structure striking vehicles were performed. Relative to conventional vehicle performance, the modified side structures demonstrated significantly enhanced crashworthiness under all of the investigated side impact conditions.

HS-800 879

**BASIC RESEARCH IN CRASHWORTHINESS
2--DYNAMIC ANALYSIS OF ELASTO-PLASTIC
SPACE FRAME STRUCTURES. INTERIM
TECHNICAL REPORT**

Calspan Corp., Buffalo, N.Y.

C. Sheu 1973 243p 38refs Rept. No. YB-2987-V-12

Contract FH-11-7622

NTIS

Crashworthiness, Energy absorbing frames, Computerized simulation, Stiffness, Beams, Structural deformation analysis, Plastic strain, Modulus of elasticity, Displacement, Plasticity, Joints, Force, Degrees of freedom, Plastic hinges, Damping, Computer programs, Fortran, Flow charts, Matrix reduction, Yield strength, Shear modulus, Mass, Computer printouts, Accident simulation, Algorithms, Equations of equilibrium, Equations of motion

An analysis of space frames is presented using the small displacement theory and with plastic deformation restricted to element end cross sections. The force-deformation relations are elastic, perfectly plastic, and the effect of the interaction of resultant forces on plastic behavior is considered, by introduction of a yield function. An initial value problem is formulated using the matrix displacement method of the finite element technique. The integration is performed by a Runge-Kutta method. An algorithm for the linear acceleration method is provided. At the end of each integration step, the yield function of the element end cross section and its gradient combined with end velocities are used to find plastic deformations, and the stiffness matrix is modified accordingly. Application to automobile crashworthiness is restricted to low speed collisions without large deformation and rotation. The computer program DEPASF, based on the analysis, is included.

HS-800 885

**BASIC RESEARCH IN CRASHWORTHINESS
2--EXPERIMENTAL VALIDATION STUDY FOR THE
LARGE DEFLECTION DYNAMIC ANALYSIS OF
PLANE ELASTO-PLASTIC FRAME STRUCTURES.
INTERIM TECHNICAL REPORT**

Calspan Corp., Buffalo, N.Y.

R. Shieh 1973 Rept. No. YB-2987-V-16

Contract FH-11-7622

NTIS

Crashworthiness, Energy absorbing frames, Structural deformation analysis, Barrier collision tests, Beams, Force, Tensile strength, Pole impact tests, Drop tests, Loading (mechanical), Yield strength, Stress (mechanics), Plastic strain, Plasticity, Displacement, Computerized simulation, Test equipment, Degrees of freedom, Buckling, Bending, Deflection, Mathematical analysis

Two series of barrier collision, pole impact, and drop tests were performed using solid and tubular rectangular cross section

member frames. Test equipment is described and test results are compared with corresponding analytical results. In the dynamic cases studied, the analytical results which include material rate-sensitivity effects correlate reasonably well with the experimental results, while the analytical results which do not include such effects correlate very poorly with experimental results.

HS-800 886

**BASIC RESEARCH IN CRASHWORTHINESS
2--STEERING ASSEMBLY, INTERIM TECHNICAL
REPORT**

Calspan Corp., Buffalo, N.Y.

For primary bibliographic entry see Fld. 5R.

HS-800 891

**ROTARY COMBUSTION ENGINES. A SELECTED
BIBLIOGRAPHY**

General Motors Res. Labs., Warren, Mich. System on Automotive Safety Information

D. M. Tekelly, comp. 1973 46p 685refs Rept. No. SASI-73-494

Corporate author

Rotary engines, Bibliographies

This bibliography is a revised and amended edition of The Wankel Engine, a Selected Bibliography 1960-1970, which was published in February 1971. Most of the entries are articles from serial publications.

HS013 459

5F. Fuel Systems

**COMPARISON OF CATALYST SUBSTRATES FOR
CATALYTIC CONVERTER SYSTEMS**

General Motors Corp., Detroit, Mich.

J. L. Harned, D. L. Montgomery 1973 17p 13refs Rept. No.

SAE-730561

Presented at Automobile Engineering Meeting, Detroit, 14-18

May 1973.

SAE

Monolithic catalysts, Pelleted catalysts, Catalytic converters, Substrates, Mass transfer, Oxidation catalysts, Reduction catalysts, Exhaust emission control, Exhaust emission control device tests, Fluid flow, Gas dynamics, Surface friction, Thermal factors, Exhaust pressure, Aluminum oxides, Reynolds number, Speed, Design of experiments

Design tradeoffs between pressure drop and conversion efficiency are examined for monolith, bead, Raschig ring, and wire mesh catalyst substrates. Monolith substrates provide greater freedom than bead substrates when designing converters for particular vehicle installations due to their low pressure drops and adaptability to vehicle space requirements. Bead substrates provide high mass transfer rates but are less adaptable than monoliths to vehicle space requirements. Raschig ring substrates provide no advantages over bead substrates in oxidizing converters, but they may have potential for use in reducing converters. Wire mesh substrates show potential for use in oxidizing converters in that they can be designed to provide mass transfer rates equivalent to those of bead substrates while retaining lower resistance to gas flow.

HS-013 449

DURABILITY OF MONOLITHIC AUTO EXHAUST OXIDATION CATALYSTS IN THE ABSENCE OF POISONS

Engelhard Minerals and Chemicals Corp.; New York
K. Aykan, W. A. Mannion, J. J. Mooney, R. D. Hoyer 1973 9p
8refs Rept. No. SAE-730592
Presented at Automobile Engineering Meeting, Detroit, 14-18
May 1973.
SAE

Monolithic catalysts, Oxidation catalysts, Carbon monoxide, Hydrocarbons, Lead, Exhaust emission control device tests, Exhaust emission control, Platinum, Exhaust composition, Thermal factors, Catalyst tests, Durability tests, Temperature endurance tests, Aging, Road tests, Lead free gasoline

Effective control of emissions of hydrocarbons and carbon monoxide for 50,000 miles was achieved in the absence of system or engine malfunctions. No increase in carbon monoxide emission and a gradual increase in hydrocarbon emission was seen over this period. The increase in hydrocarbon emission was compared to that observed for a series of catalysts, hydro-thermally aged in the laboratory, indicating that the gradual increase was due primarily to thermal effects. An analysis of the lead distribution in lead-free gasoline was made, indicating that with 0.05 grams per gallon maximum lead level (per EPA regulations) less than 0.03 grams per gallon would be valid for certification of automobiles.

HS-013 451

THE EFFECT OF LEAD, SULFUR, AND PHOSPHORUS ON THE DETERIORATION OF TWO OXIDIZING BEAD-TYPE CATALYSTS

General Motors Corp., Detroit, Mich.
R. A. Giacomazzi, M. F. Homfeld 1973 13p 5refs Rept. No. SAE-730595
Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.
SAE

Pelleted catalysts, Oxidation catalysts, Catalyst tests, Catalytic converters, Lead, Sulfur, Phosphorus, Platinum, Palladium, Exhaust emission control device tests, Durability tests, Hydrocarbons, Carbon monoxide, Contaminants, Oils, Gasoline, Deterioration

Six fuels and a special oil were tested with platinum and palladium catalysts. Both catalysts showed deterioration with miles, even with the fuel having contaminant levels below federal limits. The platinum catalyst had the least deterioration, perhaps because it had a higher loading than did the palladium catalyst. Increasing lead in the fuel from 0.012 to 0.045 g/gal increased deterioration an undesirable amount. An increase in sulfur in the fuel from 0.01 to 0.03% did not increase deterioration. This confirms that severe sulfur control is not needed for noble metal catalysts. Increasing phosphorus in the fuel from 0.006 to 0.013 g/gal was harmful. Removing calcium from the oil did not decrease deterioration.

HS-013 452

FUEL LEAD AND SULFUR EFFECTS ON AGING OF EXHAUST EMISSION CONTROL CATALYSTS

Mobil Res. and Devel. Corp., New York
S. S. Hetrick, F. J. Hills 1973 32p 16refs Rept. No. SAE-730596
Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.
SAE

Oxidation catalysts, Catalyst tests, Exhaust emission control device tests, Lead, Sulfur, Aging, Thermal degradation, Monolithic catalysts, Pelleted catalysts, Carbon monoxide, Propane, Coldstarts, Warmup, Thermal factors, Lubricating oils, Base metal, Precious metals, Contaminants, Exhaust emission tests, Lead free gasoline, Low lead gasoline

Noble and base metals on pelleted and monolithic supports were aged 12,000 miles in engine dynamometer operation using a multi-tube converter. The engine was operated over a modified AMA durability cycle on the same base fuel containing different amounts of trace lead (0.003 to 0.075 g/gal.) and sulfur (0.004 to 0.10 wt. %). Catalysts were aged at two temperatures, 1000 and 1350F, and with two lubricants, with and without metallic additives. Catalyst activity determined in cold-start bench tests indicates that, for noble metal monolithic and pelleted catalysts, the loss of CO and propylene conversion with aging is not significantly affected by differences in the fuel lead and sulfur contents studied. The ability of aged catalysts to convert propane is degraded by higher fuel lead content at trace levels. Significantly smaller amounts of lead are accumulated on catalysts when they are aged at the lower temperatures.

HS-013 453

A TURBOCHARGED SPARK IGNITION ENGINE WITH LOW EXHAUST EMISSIONS AND IMPROVED FUEL ECONOMY

Michigan Technological Univ., Houghton
For primary bibliographic entry see Fld. 5D.
HS-013 456

51. Inspections

SAFETY ROAD CHECKS, MOTOR CARRIERS OF PROPERTY, JULY THROUGH DECEMBER, 1971

111972? 1219P
Corporate author

Vehicle inspection, Commercial vehicles, Defects, Truck maintenance, Failure caused accidents, Brake failures, Tire failures, Tire tread depths, Tire inflation pressure

In the second half of 1971, roadside inspections of 22,652 trucks, tractors, trailers, and semitrailers showed that 5,316 (23.5%) were mechanically unfit to continue their runs. Inspected units removed from service because of mechanical condition decreased from 24.2% in the first half of 1971, to 23.5% in the final half. However, the fact that inspections regularly turn up many vehicles with serious defects indicates that motor carrier industry inspection and maintenance practices have been inadequate. From 1968-1971, brake defects caused 2,235 accidents (24% of reported defect accidents), while inspection reports listed 88,937 instances of faulty brakes (33.7% of defects reported), Tire defects caused 1,593 accidents (17.3% of defect accidents), costing 56 lives (29.8% of the total) and —9,870,528 property damage (32.4% of the total). Inspections during this period revealed 13,991 tire defects (5.3% of the total) including 2,397 out of service tire defects (4.3% of out of service defects).

HS-013 424

SERVICING VEHICLES IN TOMORROW'S ENVIRONMENT

Volkswagen of America, Inc., Englewood Cliffs, N.J.
For primary bibliographic entry see Fld. 5K.
HS-013 438

STATUS AND MEASUREMENT OF VEHICLE-IN-USE DEFECTS

Ultrasystems, Inc., Newport Beach, Calif.

F. Oaxaca 1973 40p

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.

Corporate author or GPO in the Symposium Proceedings

Vehicle inspection, Defects, Diagnostic centers, Mobile inspection stations, Automated inspection, Computerized diagnostic equipment, Data analysis, Computer printouts, Standardization, Reviews

Research on vehicle defects, conducted primarily by means of vehicle inspection is reviewed. The results of this research can be used as a data base to set standards which must be met by vehicles being inspected by computerized methods. Mobile inspection facilities are useful for research quality inspection data collection, since the research does not interfere with the inspection as it might in a stationary diagnostic center, personnel and specialized equipment can travel with the facility, and the facility can cover a wide geographic area. Mobile inspection facilities help to procure more test vehicles because they can be more conveniently located than fixed facilities. The inspection data collected is summarized in tabular form.

HS-013 439

5J. Lighting Systems

NEW HEADLIGHTING SYSTEMS PROVIDE INCREASED VISIBILITY

General Motors Corp., Detroit, Mich.

P. W. Maurer, A. J. Gioia, R. W. Oyler 1973 14p 8refs

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Headlamp design, Headlamp mounting height, Three beamed headlamps, Sight distances, Headlamp daytime usage, Headlamp brightness, Headlamp standards, Rural roads, Passing, Night visibility, Sealed beam headlamps, Two lane roads, Low beamed headlamps, High beamed headlamps

The use of rectangular headlamps could provide better space utilization in two beamed systems with an improved upper beam, and in three beamed systems with the same improved upper beam and an added mid beam. This mid beam has been designed for use on either two lane, bidirectional roads or limited access highways. Incorporated also would be daytime front running lamps for better recognition of direction of travel and for better distance judgment. In the daytime front running lamp system, existing or added filaments in sealed beamed headlamps would be lighted automatically whenever the vehicle was in use and the headlights themselves were not otherwise turned on.

HS-013 418

OPTIMUM TWO-LAMP HEADLIGHTING SYSTEM. FINAL REPORT

Southwest Res. Inst., San Antonio, Tex.

R. H. Hemion, R. W. Hull 1973 31p 9refs Rept. No. AR-891

Contract DOT-HS-024-2-415

Report for 31 May 1972-31 May 1973.

NTIS

Headlamp design, Three beamed headlamps, Headlamp tests, Night visibility, Sight distances, Headlamp glare, Specifica-

tions, High beamed headlamps, Low beamed headlamps, Lamp multiplicity, Lamp filaments, Photometers, Target detection, Feasibility studies, Test equipment

The development of a three-beam mode, two headlamp lighting system was studied; beam pattern specifications for optimized low, mid, and high beams were devised and used as targets for lamp construction. An experimental test program was conducted to compare the two lamp, three-beam system with a four lamp, three-beam system for the various beam modes of each. Two principal measurements made during the tests were the target detection distance and the glare to which the observer was subjected. An examination of the test results indicates that the feasibility of achieving a satisfactory three-beam headlighting system from two headlamps has not been established, and it is doubtful that any major improvement over the performance achieved by these designs can be expected.

HS-800 890

5K. Maintenance And Repairs

SAFETY ROAD CHECKS, MOTOR CARRIERS OF PROPERTY, JULY THROUGH DECEMBER, 1971 111972? 1219P

Corporate author

Vehicle inspection, Commercial vehicles, Defects, Truck maintenance, Failure caused accidents, Brake failures, Tire failures, Tire tread depths, Tire inflation pressure

In the second half of 1971, roadside inspections of 22,652 trucks, tractors, trailers, and semitrailers showed that 5,316 (23.5%) were mechanically unfit to continue their runs. Inspected units removed from service because of mechanical condition decreased from 24.2% in the first half of 1971, to 23.5% in the final half. However, the fact that inspections regularly turn up many vehicles with serious defects indicates that motor carrier industry inspection and maintenance practices have been inadequate. From 1968-1971, brake defects caused 2,235 accidents (24% of reported defect accidents), while inspection reports listed 88,937 instances of faulty brakes (33.7% of defects reported), Tire defects caused 1,593 accidents (17.3% of defect accidents), costing 56 lives (29.8% of the total) and —9,870,528 property damage (32.4% of the total). Inspections during this period revealed 13,991 tire defects (5.3% of the total) including 2,397 out of service tire defects (4.3% of out of service defects).

HS-013 424

SERVICING VEHICLES IN TOMORROW'S ENVIRONMENT

Volkswagen of America, Inc., Englewood Cliffs, N.J.

J. Metz, K. Keller 1973 51p 9refs

Presented at Vehicle Safety Res. Integrated Symposium, Washington, D.C., 30-31 May 1973.

GPO in the Symposium Proceedings

Vehicle maintenance, Diagnosis, Vehicle inspection, Automated inspection, Computerized diagnostic equipment, Inspection equipment, Marketing, Maintenance costs, Defects, Volkswagen of America, Inc., Automotive parts, Standardization, Public opinion

Because only a few components require regularly scheduled maintenance, the majority of Volkswagen (VW) servicing in-

volves computerized diagnosis. Automated inspection is already in service with 3,000 VW dealers in Europe, and in 1973 practically all 1,200 VW dealers in the United States will offer this system to VW customers. Alternative diagnostic systems, including on-board/off-board diagnosis, off-board test equipment, on-board diagnosis, predetermined parts replacement, and extended parts durability, are evaluated. Predetermined parts replacement is currently the most logical method of vehicle maintenance because it provides a clearer picture of total service costs and more efficient utilization of shop capacity. Uniform component design and performance and quality standards are not feasible because of differences in vehicle design. Categories of components to be inspected are outlined. The public generally favors diagnosis and disregards the idea of safety.

HS-013 438

5N. Occupant Protection

DRIVER SYSTEM--DESIGN AND PRODUCTION

General Motors Corp., Detroit, Mich.

R. H. Haas 1973 12p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Occupant protection, Restraint system design, Air bag restraint systems, Knee restraints, Energy absorbing steering columns, Steering wheel design, Air bag inflation devices, Restraint system tests, Barrier collision tests

A driver air bag restraint system has been developed by General Motors' Oldsmobile Division to meet the new Motor Vehicle Safety Standard 208. A discussion of how this system is designed to function and a detailed description of its components are presented. The main elements of the driver air bag system include a new energy absorbing steering column with a revised mounting system; a steering wheel which houses a chemical gas generator and air cushion; and an instrument panel which includes a knee restraint to absorb lower torso energy. The restraint system performed well in barrier collision tests.

HS-013 409

DUMMIES--THEIR FEATURES AND USE

General Motors Corp., Detroit, Mich.

For primary bibliographic entry see Fld. 3B.

HS-013 411

FRONT PASSENGER SYSTEM--DESIGN AND PRODUCTION

General Motors Corp., Detroit, Mich.

D. D. Cambell, E. H. Klove, Jr. 1973 8p

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 Jun 1973.

Corporate author

Air bag restraint systems, Restraint system design, Front seat passengers, Occupant protection, Air bag inflation devices, Sensors, Barrier collision tests, Restraint system tests, Animal experiments, Test volunteers, Reliability, Quality control, Knee restraints, General Motors Corp.

The General Motors air bag restraint system is made up of three subsystems consisting of a sensing system, a driver's restraint system, and a passenger's restraint system. The sensing system

provides the crash impact signal necessary to actuate both the restraint systems and consists of a bumper impulse detector and a passenger's compartment crash sensor. The driver's restraint system includes an energy absorbing steering column, the steering wheel and its air bag, and a knee restraint pad. The passenger's system consists basically of an inflator, manifold, diffuser, inner cushion, and outer cushion. Barrier collision and multiple impact tests using dummies have been conducted to test the air bag restraint systems. Dynamic test with animals and test volunteers have also been performed. The stringent procedures that have been undertaken by General Motors to assure production of reliable air bag restraint systems are described.

HS-013 412

OCCUPANT PROTECTION RESEARCH NEEDS

General Motors Corp., Detroit, Mich.

D. E. Martin, A. J. 1973 9P

Presented at General Motors Automotive Safety Seminar, Warren, Mich., 20-21 June 1973.

Corporate author

Occupant protection, Safety research, Accident survivability, Anthropomorphic dummies, Injury research, Barrier collision tests, Human body impact tolerances, Test equipment, Restraint systems, Crashworthiness, Structural design, Accident research

Crash survival research needs in the areas of injury criteria, anthropomorphic dummies, barrier test performance, restraint systems, and structural integrity are briefly discussed. It is felt that basic technology in crash survivability testing and human tolerance is not adequate to meet the demands placed upon it by the urgency of the national safety effort. The differences between passing an engineering test and achieving occupant protection in accidents are pointed out. It is concluded that an understanding of safety needs can only be achieved through a greater knowledge of real world crashes; that is, more and better accident data.

HS-013 419

TESTING AND EVALUATION OF INFLATABLE RESTRAINTS AND INTERIORS AS RELATED TO VEHICLE SAFETY RESEARCH

111973 1228P Rept. No. J-9000-2857

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.

GPO in the Symposium Proceedings

Restraint system tests, Air bag restraint systems, Restraint system effectiveness, Occupant protection, Anthropometric dummies, Barrier collision tests, Impact sleds, Impact velocity, Acceleration response, Severity indexes, Test reproducibility, Three point restraint systems, Vehicle size, Human body size

Air bag restraint system research projects conducted by the Southwest Research Institute, Wayne State University, Agbabi Associates, and Dynamic Science are reviewed. Research results indicate that prototype front seat inflatable occupant restraint systems (IORS) evaluated under National Highway Traffic Safety Administration contracts appear capable of meeting requirements of the current federal safety standards for both subcompact and full size sedans, at impact velocities of 30 mph, and for a range of occupant sizes from 5th percentile female through 95th percentile male; current production

Group 5N—Occupant Protection

lap/shoulder belt systems appear capable of providing occupant survival in barrier impacts at 30 mph for adult occupants where head injury criteria are not considered; and consistent attainment of 50 mph barrier impact survival by vehicle occupants will be very difficult, even with vehicles of highly advanced structural configuration using the most advanced of currently available IORS.

HS-013 426

DEVELOPMENT OF ADVANCED DEPLOYABLE RESTRAINTS AND INTERIORS

D. Friedman 1973 55p

Presented at Vehicle Safety Res. Symposium, Washington, D.C., 30-31 May 1973.

Author or GPO in the Symposium Proceedings

Air bag restraint systems, Restraint system design, Restraint system effectiveness, Deceleration, Crush distance, Air bag inflation time, Benefit cost analysis, Accident costs, Injury prevention, Occupant protection, Knee restraints, Compact automobiles, Vehicle size, Accident studies, Impact velocity, Impact angle, Deformation, Occupant kinematics, Vehicle vehicle collisions, Structural design, Air bag inflation devices, Acceleration tolerances, Restraint system tests, Vehicle vehicle interface

In order to optimize air bag restraint system performance and thereby minimize casualties, it is necessary to: characterize real world accidents; optimize structural compatibility between cars; define the relationship between structural performance and restraint performance; and determine how much can be spent on restraint and structural changes, based on the benefits derived. These factors are analyzed to determine the design requirements for a successful advanced deployable restraint. The resulting non-energy absorbing or elastic bag system, designed to reduce casualties up to 50 mph, is described. At present, frontal 50 mph barrier equivalent velocity performance with the advanced deployable restraint for drivers of 4,000 lb cars has been achieved with about 80% restraint efficiency and within an increased cost over conventional deployable restraints estimated at about —20 per car. It is estimated that the same system could be effective in a sub-compact car to about 40 mph in a frontal barrier crash and to 50 mph in an oblique barrier crash.

HS-013 430

MOTORCYCLE CRASH SAFETY RESEARCH

Denver Univ., Colo.; Caliber Design Ltd., Stratford (England)

For primary bibliographic entry see Fld. 5C.

HS-013 435

TESTING AND EVALUATION WITH HUMAN VOLUNTEERS

National Hwy. Traf. Safety Administration, Washington, D.C.

T. H. Glenn 1973 32p 11refs

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.

GPO in the Symposium Proceedings

Test volunteers, Impact tests, Design of experiments, Impact sleds, Physical examinations, Anthropometry, Test facilities, Liability, Insurance

Impact experiments with living human subjects have been severely limited by the shortage of man-rated sled test facilities.

This is due to the general unwillingness of organizations, other than the military installations, that have sleds, to deal with human volunteer subjects because of the possible injury liabilities, the lack of required medical facilities and personnel, and the problems involved in the recruiting and motivating of volunteers. Previous test programs have produced limited results because they have been geared for evaluation of military hardware, the volunteers were not representative of the driving public, and because of difficulties in mounting instrumentation on living humans. Impact tests using human volunteers can be more effective if experiments are carefully designed to protect each subject; anthropometric data are collected for all subjects before the experiments begin; new test facilities are used; and volunteers are carefully screened, insured, and medically supervised.

HS-013 441

GENERAL MOTORS DRIVER AIR CUSHION RESTRAINT SYSTEM

General Motors Corp., Detroit, Mich.

T. N. Louckes, R. J. Slifka, T. C. Powell, S. G. Dunford 1973

19p Rept. No. SAE-730605

Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.

SAE

Air bag restraint systems, Air bag inflation time, Air bag inflation devices, Sensors, Energy absorbing steering columns, Knee restraints, Barrier collision tests, Barrier impact forces, Loading (mechanical), Crash phase, Occupant kinetics, Rebound, Occupant protection, Seat occupation, Front seat passengers

The operation and performance of the system is described. Detailed descriptions of the component parts, crash sensors, steering column, and air cushion module are presented.

HS-013 454

DESCRIPTION AND USE OF A MEASUREMENT SYSTEM FOR AIR BAG ACOUSTIC TRANSIENT DATA ACQUISITION AND ANALYSIS. FINAL REPORT

Aerospace Medical Res. Lab., Wright-Patterson AFB, Ohio

H. C. Sommer 1973 41p 2refs Rept. No. AMRL-TR-73-8

Contract DOT-IS-0-1-2160

Report for Apr 1971-Jun 1972.

NTIS

Air bag restraint systems, Acoustic measurement, Instrumentation, Frequencies, Pressure time histories, Spectral analysis, Data acquisition, Data analysis, Calibration, Air bag inflation time, Tape recorders, Oscillographs, Transducers, Sound intensity

A special instrument package was assembled for use in rendering and analyzing air bag acoustic transients. Several different air bag configurations were measured from front and rear seat positions during two separate field studies with data reduction performed by analysis of oscillograph traces and energy spectral density content. To adequately define both the low and high frequency content of the air bag acoustic transient a system should be used which has a flat frequency response from 0 Hz (DC) to approximately 20 KHz. As the low frequency limit increases in frequency, the peak over pressure and duration of the impulse decrease. The results of the field investigation were

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VEHICLE SAFETY—Field 5

Steering Control Systems—Group 5R

compared to those of an earlier study which exposed human subjects to air bag acoustic transients.
HS-013 458

BASIC RESEARCH IN CRASHWORTHINESS 2--FURTHER REFINEMENT IN ENGINE DEFLECTION CONCEPT. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Fld. 5D.
HS-800 868

AN EVALUATION OF THE DYNAMIC PERFORMANCE CHARACTERISTICS OF ANTHROPOMORPHIC TEST DEVICES. VOL. 2. SUPPLEMENTAL DATA REPORT. FINAL REPORT

Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Fld. 3B.
HS-800 870

BASIC RESEARCH IN CRASHWORTHINESS 2--DEVELOPMENT AND TESTING OF VEHICLE SIDE STRUCTURE MODIFICATIONS. INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Fld. 5D.
HS-800 879

BASIC RESEARCH IN CRASHWORTHINESS 2--STEERING ASSEMBLY, INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.
For primary bibliographic entry see Fld. 5R.
HS-800 891

5R. Steering Control Systems

DRIVER-VEHICLE CONTROL PERFORMANCE

General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Fld. 3D.
HS-013 410

DRIVER FACTORS AND DRIVER MODELING AS THEY RELATE TO VEHICLE HANDLING RESEARCH

Systems Technology, Inc., Hawthorne, Calif.
For primary bibliographic entry see Fld. 3D.
HS-013 431

MODELING AND SIMULATION IN VEHICLE HANDLING RESEARCH

P. F. Bohn 1973 81p 33refs Rept. No. BCE-T-0421
Presented at Vehicle Safety Res. Integration Symposium,
Washington, D.C., 30-31 May 1973.
Author or GPO in the Symposium Proceedings

Vehicle handling, Simulation models, Computerized simulation, Automobile modeling, Steering, Guidance systems, Degrees of freedom, Performance tests, Deceleration, Sideslip, Pavement surface texture, Roll, Lane changing, Equations of motion,

The reason for modeling and simulation are that computer experiments are less expensive, more convenient, not affected by the environment, and repeatable; modeling and simulation activities force a thorough examination of a physical problem; and once a system is modeled, the simulation activity prompts parameter and initial condition questions and provides feedback to modify the understanding of the phenomena. A history of vehicle handling simulations is presented. The recent trend in vehicle handling simulations has been toward the use of the hybrid computer. Currently available vehicle handling simulation programs, required simulation data, and the need for and method of model verification are discussed. Sample transient responses from a National Highway Traffic Safety Administration hybrid computer simulation for computer runs with braking and steering inputs are presented. Also included is a bibliography of recently developed vehicle models and simulations.
HS-013 433

OPEN- AND CLOSED-LOOP TESTING AND HOW THEY ARE INTEGRATED IN VEHICLE HANDLING AND DYNAMICS RESEARCH

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
L. Segel, R. D. Ervin 1973 25p 22refs
Presented at Vehicle Safety Res. Integration Symposium,
Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

Vehicle handling, Vehicle dynamics, Performance tests, Vehicle control, Driver performance, State of the art studies, Servomechanisms, Guidance systems, Vehicle performance

An evaluation of vehicle handling requires that closed-loop testing be employed. Open-loop testing measures the static and dynamic response properties of the motor vehicle alone, but does not take into account driver performance and other factors which contribute to vehicle handling. Therefore, open- and closed-loop test procedures are required to measure vehicle dynamics behavior and vehicle handling performance, respectively. The present state of the art of open- and closed-loop testing is reviewed and applications of closed- and open-loop test procedures employed by the Clayton Manufacturing Co., Cornell Aeronautical Laboratory, Michigan University Highway Safety Research Institute, and Digitek Corp. as they relate to evaluating safety performance are presented.
HS-013 436

PARTICULAR HANDLING SAFETY PROBLEMS OF TRUCKS AND ARTICULATED VEHICLES

IIT Res. Inst., Chicago, Ill.
R. L. Eshleman 1973 65p 50refs
Presented at Vehicle Safety Res. Integration Symposium,
Washington, D.C., 30-31 May 1973.
GPO in the Symposium Proceedings

Vehicle handling, Articulated vehicle performance, Truck handling, Articulated vehicle modeling, Vehicle stability, Mathematical models, Computerized simulation, Simulation models, Vehicle road interface, Reviews, Tire traction, Tire slip motion, Tire forces, Road conditions, Pavement surface texture, State of the art studies, Mathematical analysis, Coefficient of friction, Highway characteristics, Environmental factors, Aerodynamics, Vehicle design, Steering, Oversteer, Braking, Cornering, Vehicle dynamics, Vehicle kinematics, Performance

Group 5R—Steering Control Systems

An integrated overview of truck and articulated vehicle handling safety technology is presented. Research utilizing modeling, mathematical analysis, and experimental techniques was evaluated to determine its role in providing safe operation of trucks and articulated vehicles. The application of this technology to the solution of safety related problems and to the establishment of operational limits is discussed. A short synopsis of related literature and a concise description of the concepts of vehicle handling and stability are included. This review shows that significant advances have been made on the analysis of articulated vehicle response in combined braking and cornering through the use of nonlinear models and advanced computational techniques; however, there is a lack of depth in complementary experimental work on articulated vehicle response. Recommendations are presented for future work in this area.

HS-013 437

DYNAMIC BEHAVIOR OF RECREATIONAL VEHICLES DURING BRAKING AND STEERING

Bendix Corp., Southfield, Mich.; Bendix Res. Labs.
For primary bibliographic entry see Fld. 5T.

HS-013 447

HUMAN FORCE CONSIDERATIONS IN THE FAILURE OF POWER ASSISTED DEVICES. FINAL REPORT

Man Factors, Inc., San Diego, Calif.

For primary bibliographic entry see Fld. 3D.

HS-800 889

BASIC RESEARCH IN CRASHWORTHINESS 2--STEERING ASSEMBLY, INTERIM TECHNICAL REPORT

Calspan Corp., Buffalo, N.Y.

F. A. DuWaldt 1973 113p 37refs Rept. No. YB-2987-V-20

Contract FH-11-7622

NTIS

Crashworthiness, Energy absorbing steering columns, Occupant protection, Impact protection, Restraint system tests, Air bag restraint systems, Knee restraints, Linkages, Drop tests, Barrier collision tests, Air bag inflation time, Angle impact tests, Impact angle, Plastic hinges, Loading (mechanical), Performance tests, Reviews, Steering system design, Deflection

The role of the steering assembly as an element of a driver restraint system in a crashworthy automobile is studied. Piggyback tests were made on instrumented vehicle impacts. Laboratory tests were conducted and data in the literature were analyzed to define elements that could enhance driver survivability, such as the steering column jacket energy absorber, air bag restraint system, hydraulic strut, knee bar, steering hub pad, and an energy absorbing four bar linkage. Air bag restraint system tests were performed with emphasis on air bag inflation time.

HS-800 891

5T. Trucks And Trailers**SAFETY ROAD CHECKS, MOTOR CARRIERS OF PROPERTY, JULY THROUGH DECEMBER, 1971 111972? 1219P**

Corporate author

Vehicle inspection, Commercial vehicles, Defects, Truck maintenance, Failure caused accidents, Brake failures, Tire failures, Tire tread depths, Tire inflation pressure

In the second half of 1971, roadside inspections of 22,652 trucks, tractors, trailers, and semitrailers showed that 5,316 (23.5%) were mechanically unfit to continue their runs. Inspected units removed from service because of mechanical condition decreased from 24.2% in the first half of 1971, to 23.5% in the final half. However, the fact that inspections regularly turn up many vehicles with serious defects indicates that motor carrier industry inspection and maintenance practices have been inadequate. From 1968-1971, brake defects caused 2,235 accidents (24% of reported defect accidents), while inspection reports listed 88,937 instances of faulty brakes (33.7% of defects reported), Tire defects caused 1,593 accidents (17.3% of defect accidents), costing 56 lives (29.8% of the total) and —9,870,528 property damage (32.4% of the total). Inspections during this period revealed 13,991 tire defects (5.3% of the total) including 2,397 out of service tire defects (4.3% of out of service defects).

HS-013 424

PARTICULAR HANDLING SAFETY PROBLEMS OF TRUCKS AND ARTICULATED VEHICLES

IIT Res. Inst., Chicago, Ill.

For primary bibliographic entry see Fld. 5R.

HS-013 437

VCON 3006 TRUCK--EXTENDING TIRE CAPACITY THROUGH INNOVATION

Peerless Mfg. Co., Dallas, Tex.

N. Petelski, L. Davis 1972 11p Rept. No. SAE-730285

Presented at National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

SAE

Dump trucks, Truck tires, Truck design, Truck performance, Frame design, Suspension system design, Steering system design, Tire traction, Tire rolling resistance, Tire inflation pressure, Tire load limits, Tire temperature, Tire spring rates, Power trains, Benefit cost analysis, Tire wear, Mathematical analysis

The world's largest mining end dump truck, the Vcon 3006, utilizes several innovations to raise vehicle performance limitations significantly and to increase the productivity/operating cost. Its capability of hauling 250 tons on eight 36.00 X 51 tires with equal load distribution and reduced load variations at increased ton mph values is provided by a walking beam frame and four independently suspended oscillating bogeys on liquid spring suspension struts. Individually powered wheels with single tires provide exceptional traction and improved tire life and reduce tire scrubbing in turns to a minimum. Its 3000 hp diesel locomotive engine provides a low fuel consumption, high performance, and reliability unmatched for a vehicle in this class. The Vcon 3006 design concept provides flexibility to match power requirements to the job and has potential for future trolley or gas turbine applications.

HS-013 443

DYNAMIC BEHAVIOR OF RECREATIONAL VEHICLES DURING BRAKING AND STEERING

Bendix Corp., Southfield, Mich.; Bendix Res. Labs.

G. B. Hickner, J. G. Elliott 1973 9p 6refs Rept. No. SAE-730524

November 28, 1973

VEHICLE SAFETY—Field 5

Wheel Systems—Group 5V

Presented at Automobile Engineering Meeting, Detroit, 14-18 May 1973.
SAE

Articulated vehicles, Recreational vehicles, Vehicle handling, Braking, Steering, Vehicle stability, Computerized simulation, Articulated vehicle performance, Research methods, Vehicle dynamics, Road tests, Trailers, Stopping distance, Equations of motion, Weight transfer, Vehicle weight, Trailer brakes, Performance tests, Surge brakes, Hydraulic brakes, Towing, Equalizer hitches

Several approaches used to study the problem of articulated vehicle handling during braking, steering, and combined braking and steering are presented. The techniques involve analyses of varying complexity including use of large scale computer models. They also include actual vehicle testing where test results are correlated with analytic results. Simplified analyses show that lack of brakes on trailers can cause greatly extended stopping distances when compared with basic tow vehicle or good trailer braking stopping distances. More detailed analyses also show areas of instability which exist for combination vehicles undergoing stopping and turning maneuvers.
HS-013 447

MOTOR CARRIER ACCIDENT INVESTIGATION. MURPHY TRANSPORTATION INC. ACCIDENT--NOVEMBER 6, 1972--WILDWOOD, FLORIDA

111972 1212P Rept. No. 72-9

Corporate author

Accident case reports, Accident investigation, Driver fatigue caused accidents, U turns, Vehicle vehicle collisions, Florida, Tractor semitrailers, Property damage accidents, Truck accidents, Wet road conditions, Reduced visibility, Negligence, Accident factors, Driver characteristics

At 10:20 p.m. a tractor semitrailer, obstructing the roadway in an illegal U turn maneuver, was struck broadside by two automobiles, one of which underrode the trailer. The driver and two passengers of this car died of impact injuries to the head and upper body. The driver's 9-year old daughter, who had

been lying across the front seat, received minor injuries. The other car collided with the right tandem wheels of the trailer and bounced back, coming to rest in the outside northbound lane. All four occupants of this car received serious injuries. The truck driver had exceeded hours of service limitations, and lack of sleep may have affected his judgment. Wet road conditions and reduced visibility contributed to the accident.

HS-013 460

5V. Wheel Systems

TIRE RESEARCH APPLIED TO VEHICLE SYSTEM SAFETY

Goodyear Tire and Rubber Co., Akron, Ohio

J. D. Eagleburger 1973 29p 13refs

Presented at Vehicle Safety Res. Integration Symposium, Washington, D.C., 30-31 May 1973.

GPO in the Symposium Proceedings

Tire research, Tire tests, Tire performance, Tire inspection, Durability tests, X ray analysis, Holography, Ultrasonics, Infrared analyzers, Tire traction, Braking, Tire test equipment, Hydroplaning, Cornering, Tire forces, Tire moments, Tire inflation pressure, Warning systems, Tire failures, Foam inflated tires, Solid tires, Nondestructive tests

In order to better relate the tire to the total vehicle system, non-destructive tire tests are being performed involving X ray analysis, holography, ultrasonics, and infrared analyzers, and destructive tire tests of braking traction, hydroplaning, and cornering force and moment measurement. Tire test results must be coordinated with in-service tire performance. New developments in tire safety which are being explored include a low pressure warning system, a limited run-flat capability, an auxiliary air chamber for fail safe tires, and foam inflated and solid tires.

HS-013 440

VCON 3006 TRUCK--EXTENDING TIRE CAPACITY THROUGH INNOVATION

Peerless Mfg. Co., Dallas, Tex.

For primary bibliographic entry see Fld. 5T.

HS-013 443

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CONTRACTS AWARDED

NHTSA CONTRACT AWARDS

DOT-HS-005-2-364

SEAT BELT TESTING

Dayton T. Brown
555 Church Street
Bohemia, Long Island, New York 11716

No change

\$14,800

This modification provides for special washing procedures for 50 groups of belts, additional photographs of 50 groups of belts, and an additional 50,000 cycles and 10,000 lockup cycles for 30 emergency locking retractors.

DOT-HS-018-3-586

FIELD SURVEY REPORTS

Control Systems Research, Inc.
1515 Wilson Blvd.
Arlington, Virginia 22209

31 June 73 to 31 Jan 74

\$4,868

This modification provides for coding and keypunching approximately 2080 field survey reports. The data will be processed and added to the original data.

DOT-HS-027-2-394

LABORATORY TEST PROCEDURES

General Testing Laboratories
General Environments Corporation
6840 Industrial Road
Springfield, Virginia 22151

5 May 72 to 17 Aug 73

\$3,760.98

This modification provides for removing and replacing the dash assemblies on seven vehicles; removing, replacing, and recharging the air conditioners on six vehicles; and removing and replacing the bumper systems on nine vehicles prior to conducting tests in accordance with FMVSS No. 210.

DOT-HS-027-3-709

PARTS RETURN PROGRAM

General Environments Corporation
7845 N. Nagle Avenue
Morton Grove, Illinois 60053

29 June 73 to 30 June 74

\$141,157.47

Failed parts from passenger cars and pick-up trucks will be collected on a nationwide basis from independent automotive repair shops. Materials will include brake, steering, and suspension items which failed during normal operation. A level of 500 participating shops is desired. The objective of the program is to disclose, as quickly as possible, patterns of failure which may lead to deaths and injuries.

DOT-HS-031-3-676

TIRE SHEAR FORCE EVALUATION

The Regents of the University of Michigan
240 Research Administration Building
Ann Arbor, Michigan 48105

25 June 73 to

\$15,216

Literature will be examined for information on the influence of wheel deceleration on longitudinal force. Available lateral tire force data will be studied to perfect data analysis techniques to obtain a numeric for side force while minimizing the number of test conditions such as slip angle, load, velocity, and surface. The influence of wheel deceleration on longitudinal force will be measured for a sample of tires.

DOT-HS-031-3-787

DATA DOCUMENTATION FOR VEHICLE HANDLING TESTS

The Regents of the University of Michigan
260 Research Administration Building
North Campus
Ann Arbor, Michigan 48105

14 Sept 73 to 30 Nov 73

\$9,810

A set of edited tapes will be produced which contain data for both the baseline and degraded system testing performed under contracts DOT-HS-031-1-159 and DOT-HS-031-1-126.

DOT-HS-032-1-036

SLED TESTS

U.S. Department of Transportation
Federal Aviation Agency
Atlantic City, New Jersey 08405

15 June 73 to 1 Nov 73

\$15,255

This modification provides for the conduct of eight sled tests simulating rear-end collisions with a mov-

ing barrier at velocities ranging from 15 to 30 mph. Front-seat configuration, dummy configuration, and equivalent barrier impact velocity are varied in the different tests.

DOT-HS-032-1-036

ROLLOVER TEST

U.S. Department of Transportation
Federal Aviation Agency
Atlantic City, New Jersey 08405

15 June 73 to 1 Nov 73

\$91,827

This modification provides for evaluation and refinement of the rollover test procedure specified in FMVSS No. 208. A test fixture (vehicle carrier) will be built and vehicle rollover tests conducted under various conditions, using at least fifteen vehicles. The test fixture will be built to hold the vehicle on an inclined transverse plane measuring 23 degrees from horizontal, and will be capable of attaining speeds of at least 30 mph. Each of the test vehicles will contain two 50th percentile male test devices. Still and high-speed photographic coverage will be accomplished. Design drawings of the vehicle carrier, and other test details are furnished by NHTSA.

DOT-HS-042-2-416

LABORATORY TEST PROCEDURES

Ogden Technology Lab
1536 East Valencia Drive
Fullerton, California 92631

13 July 73 to 1 Dec 73

\$12,622.50

Four vehicles will be tested in accordance with procedures specified in FMVSS Nos. 204 and 212.

DOT-HS-046-3-694

SCHOOL BUS SAFETY IMPROVEMENT PROJECT

Dynamic Science Division
Ultrasystems, Incorporated
1850 West Pinnacle Peak Road
Phoenix, Arizona 85027

28 June 73 to 30 June 74

\$299,301

A study will be conducted to improve the crashworthiness and accident avoidance capability of school buses. A modified bus will be subjected to handling, braking

and operational tests, a racking test, a side-impact barrier crash, a roof-loading test, and associated component tests necessary to evaluate the improvements attained in areas of crashworthiness and accident avoidance over baseline test results.

DOT-HS-150-3-668

EFFECT OF MARIJUANA AND ALCOHOL ON VISUAL SEARCH PERFORMANCE

The Regents of the University of California
University of California
405 Hilgard Avenue
Los Angeles, California 90024

18 June 73 to 18 June 74

\$149,916

A study will be made to investigate the effects of marijuana and alcohol on the driver's visual search processes by the use of eye movement recording techniques in an experimentally controlled situation. The purpose is to determine by analysis if these drugs have a significant effect on the driver's visual search and recognition capability which may result in accident causation. A driving simulator will be used in which the drivers task will be to view a roadway scene in which he is required to search for and signal the occurrence of critical events while simultaneously controlling vehicle heading. The roadway scene, scene analysis, eye movement recording, task selection, subject selection, data analysis, and other aspects of the tests are specified by NHTSA.

DOT-HS-164-2-347

ASAP CONFERENCES

Organizational Development Associates
1500 Massachusetts Ave., N.W.
Washington, D.C. 20005

19 April 72 to 15 Dec 73

\$7,600

This modification provides for services required to complete three ASAP conferences in Sioux City, Salt Lake City, and Oklahoma City.

DOT-HS-169-2-464

SAFETY-RELATED DEFECTS (SRD) INVESTIGATION

Value Engineering Company
2550 Huntington Avenue
Alexandria, Virginia 22303

24 Apr 73 to 7 May 73

\$9,241.35

This modification provides for visits to, and personal interviews with, 17 vehicle owners who experienced tie rod end failure. The interviews are to develop all pertinent data concerning certain selected cases of failure.

DOT-HS-192-2-311

REPORT GENERATION

Peat, Marwick, Mitchel and Co.
1025 Connecticut Avenue, N.W.
Washington, D.C. 20036

27 Aug 73 to 1 Oct 74

\$59,121

This modification provides for all new program documentation and related data processing procedures to be incorporated in the FMIAS system documentation and data processing operations manual; further, that all necessary modifications will be identified and appropriate systems changes will be made to the FMIAS.

NHTSA-204-3-611

UPDATING MOTORCYCLE ACCIDENT DATA BASE

Small Business Administration (Prime)
Bala Cynwyd, Pennsylvania 19000

Opportunity Systems, Inc. (Sub)
1330 Massachusetts Avenue, N.W.
Washington, D.C.

9 Sept 73 to 31 Dec 73

\$20,683

This modification provides for the enlargement of the Michigan/Illinois Bi-Level Data Base by extracting information in coded form from approximately 1,000 additional Illinois source documents, and updating Files I, II, and III with the corresponding automated records. The updated tapes of Files II and III will be reformatted. An additional 25 basic tabulations of one- and/or two-way tables of motorcycle data are provided for.

DOT-HS-204-3-684

TIRE IDENTIFICATION AND RECORDKEEPING COMPLIANCE SURVEY

Small Business Administration
849 South Broadway
Los Angeles, California 90014

30 June 1973 to 30 Nov 73

\$47,325

Purchase, or offer to purchase, will be made of certain specified brands and quantities of tires in designated Western areas of the United States to verify the compliance by retail dealers with the Tire Identification and Recordkeeping Regulations, Part 574.

DOT-HS-204-3-685

TIRE IDENTIFICATION AND RECORDKEEPING COMPLIANCE SURVEY

Small Business Administration
1 Decker Square
Suite 400, East Lobby
Bala Cynwyd, Pennsylvania 19004

26 June 1973 to 30 Nov 1973

\$50,000

Purchase, or offer to purchase, will be made of certain specified brands and quantities of tires in designated Eastern areas of the United States to verify the compliance by retail dealers with the Tire Identification and Recordkeeping Regulation, Part 574.

DOT-HS-261-3-771

VEHICLE DISABLEMENT STUDY

Traffic Safety Research Corp.
1010 Corporation Way
Palo Alto, California 94303

29 June 73 to 30 Jan 74

\$50,772

An analysis will be made of the causes of vehicle disablement in order to provide a factual basis for designing an effective countermeasure program. Failures will be identified, with their cause and frequency, together with the make, model, and year of manufacture when appropriate.

DOT-HS-262-2-467

EXPERIMENTAL SAFETY VEHICLE TESTS

General Motors Corp.
General Motors Environmental Activities Staff
General Motors Technical Center
Warren, Michigan 48090

30 June 72 to 31 May 73

Decreased \$13,500

This modification deletes certain tasks involving the teardown and analysis of the test vehicle. The modification provides for the removal and scrapping of residue; and the loan, for exhibit, of ESV-10 show car.

DOT-HS-317-3-608

UPDATE OF USERS AND LABORATORY MANUALS

Control Data Corporation
Professional Services Division
901 South Highland Street
Arlington, Virginia 22204

26 Sept 73 to 31 Dec 73

\$9,500

This modification provides for updating both the Users and the Laboratory Procedures manuals to reflect new data not presently included, and to revise obsolete material.

DOT-HS-341-3-666

INSTALLATION OF AUTOMOTIVE CRASH RECORDERS

General Motors Corporation
Environmental Activities Staff
Automotive Safety Engineering
Warren, Michigan 48090

21 June 73 to 21 June 74

\$

Five hundred fifty automotive crash recorders and related items will be consigned to General Motors Corporation to be installed on certain vehicles which are equipped with Air Cushion Restraint Systems (ACRS). These vehicles are to be used in field tests to evaluate the effectiveness and reliability of the ACRS. The purpose is to obtain quantitative crash data with these systems.

DOT-HS-343-3-682

SPECIAL ADJUDICATION FOR ENFORCEMENT PROGRAM (SAFE)

State of Washington
Department of Motor Vehicles
12th and Franklin
Olympia, Washington 98504

29 June 1973 to 29 June 1976

\$200,000

The worth of noncriminal driver adjudication/improvement processes, techniques, and sanctions designed to improve deterrence and to reduce traffic violator recidivism will be demonstrated and evaluated. Empirical tests will be made in selected jurisdiction, effectiveness will be determined, and those

types of essential driver improvement activities which are most enhanced by the application of special adjudication/improvement processes, techniques, and sanctions will be determined.

DOT-HS-358-3-730

IMPLEMENTATION AND OPERATION OF FATALITY ANALYSIS FILE

State of Delaware
State Police Headquarters
P.O. Box 430
Dover, Delaware 19901

30 June 73 to 30 June 74

\$1,860

A research-oriented file will be established as a means of evaluating the Alcohol Countermeasures Program, and of generating the foundations of the structure necessary for each State to participate in the Information and Data System as a "Basic State."

DOT-HS-360-4-736

DATA CONVERSION SERVICES FOR NATIONAL DRIVER REGISTER

Maryland National Optimation Services, Inc.
11734 Parklawn Drive
Rockville, Maryland 20852

2 July 73 to 30 June 74

\$120,569.50

Data conversion from an estimated 2,700,000 hard copy and microfilm source documents to magnetic tape will be performed for the National Driver Register. The source documents to be converted will be in various formats and will contain differing data elements.

DOT-HS-4-00790

FORKLIFT, CLARK, MODEL C500-Y30

Potomac Industrial Trucks, Inc.
5108 Buchanan Street
Hyattsville, Maryland 20781

30 July 73 to 31 July 73

\$8,726.50

This contract provides for the purchase of one liquid propane gas-powered, pneumatic-tired lift truck, 3000-pound capacity.

DOT-HS-4-00793

**CRUSH CHARACTERISTICS OF AUTOMOTIVE
STRUCTURAL COMPONENTS**

National Bureau of Standards
Administration Building
Gaithersburg, Maryland 20790

25 Sept 73 to 31 Aug 74

\$110,000

Research will be undertaken to develop methods for evaluating the crush characteristics of automotive structural components, including doors, door beams, pillars, latching mechanisms, and certain connections. Both new and old vehicles will be tested. Parameters will include component geometry, degree of edge support, and the angle of loading. An impact facility will be designed and constructed. A comprehensive program will be developed to analyze the test results.

DOT-HS-4-00794

**NATIONAL ACCIDENT SUMMARY TECHNICAL
ASSISTANCE FOR OPERATIONS**

Safety Management Institute
1660 L Street, N.W., Suite 709
Washington, D.C. 20036

22 Aug 73 to 31 Jan 74

\$12,721

Detailed tabulation and statistical data will be produced from the last quarter of 1972 and 1973 accident

reports of four specified States. This data is required for the evaluation of the interlock systems installed on automobiles beginning with the 1974 model year.

DOT-HS-00796

GOVERNOR'S REPRESENTATIVE CONFERENCE

Organizational Development Associates
1500 Massachusetts Ave., N.W.
Washington, D.C. 20005

11 Sept 73 to 31 Oct 73

\$11,664.57

Twelve days of consultation and support services will be provided for the National Conferences of Governor's Highway Safety Representatives Annual Conference.

DOT-HS-4-00797

TRANSLATION SERVICES

Berlitz Schools of Languages
1701 K Street, N.W.
Washington, D.C. 20006

26 Sept 73 to 15 Oct 73

\$3,600

Approximately 150 pages (90,000 words) single-space copy to be translated into French from English.

**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

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